The Pennsylvania State University

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UPPER MANTLE STUCTURE BENEATH THE NORTHERN EAST AFRICAN PLATEAU FROM P- AND S-WAVE BODY-WAVE TOMOGRAPHY

A Thesis in

Geosciences

by

Cathleen Bressers

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The thesis of Cathleen Bressers was reviewed and approved* by the following:

Andrew Nyblade
Professor of Geosciences
Thesis Advisor

Charles Ammon
Professor of Geosciences

Christelle Wauthier
Assistant Professor of Geosciences

Mark E. Patzkowsky
Professor of Geosciences
Associate Head of the Graduate Programs and Research

*Signatures are on file in the Graduate School

ABSTRACT

The AfricaArray NE Uganda Seismic Network was deployed to address the lack of resolution in existing upper mantle body wave tomography models beneath the northern part of the East African Plateau. The nine-station broadband seismic array ran from January 2017 to December 2018. Data from the network were added to an existing body-wave travel times dataset spanning 1985-2015 constructed using data from over 300 seismic stations throughout East Africa. Data from teleseismic earthquakes were used to generate P and S wave travel time residuals using a multichannel cross correlation method and then inverted for V_p and V_s tomographic images of the upper mantle. The resulting models show two new features referred to as Anomaly A and Anomaly B. Anomaly A is a fast wave-speed anomaly (FWA) located in north-central Uganda. The FWA extends from approximately 100 km to 300 km depth, it coincides with the location of the Ugandan Basement Complex, and it extends north of the Aswa Shear Zone (ASZ), indicating that the ASZ disrupts the upper mantle structure. Anomaly A may either be interpreted as the northwestern extension that is part of thick cratonic lithosphere of the Tanzania Craton or else a southeastern extension of the Congo Craton lithosphere. Anomaly B is a low wave-speed anomaly (LWA) in eastern Uganda along the border with Kenya that extends from depths of 100 km to 300 km. From tabular body resolution tests, Anomaly B appears to be an extension of an LWA beneath the Kenya Rift imaged in previous studies. Anomaly B extends beneath the northeastern corner of the East African Plateau away from the rift proper, and may be an extension of the African Superplume, which is upwelling around the thick lithosphere of the Tanzania Craton.

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ACKNOWLEDGEMENTS

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Chapter 1

Introduction

The Cenozoic East African Plateau and Rift System (EARS) is the archetypal proxy for understanding continental rifting, yet the dynamics of Cenozoic rifting, volcanism and uplift in eastern Africa are not constrained by geophysical studies throughout the entire region. The EARS extends from the Afar depression in the north to Mozambique in the south (Figure 1-1) [*O'Donnell et al.*, 2013]. A number of global and regional tomography models have been developed for the region, showing fast upper mantle (~35 to 410 km depth) structure beneath several cratonic blocks and slower upper mantle in between, with additional discrete regions of even slower upper mantle beneath areas of Cenozoic volcanism. One area of eastern African that remains poorly studied is the northern part of the East African Plateau in northern Uganda. This thesis addresses the lack of seismic imaging of the upper mantle in this region with a new body-wave tomography model that extends previous models across the northern part of the East African Plateau (Figure 1-1). The new model elucidates upper mantle structure across northern Uganda and parts of northern Kenya and South Sudan, providing new insights into the deep structure of the Archean Tanzania Craton and Eastern Branch of the EARS.

1.1: East African Plateau and Rift System Overview

The Archean Tanzania Craton lies in the center of the East African Plateau and is surrounded by several mobile belts, including the Mezoproterozoic Rwenzori Belt in the north, the Paleoproterozoic Ubendian/Usagaran Belts to the south, the Mezoproterozoic Kibaran Belt to the west and the Neoproterozoic Mozambique Belt to the east (Figure 1-1) [*O'Donnell et al.*, 2013]. Elevation in the plateau is unusually high, at a mean elevation of about 1 km [*Mulibo and Nyblade*, 2013]. Uplift of the plateau may have occurred as early as 25 Ma [*Roberts et al.*, 2012], but a precise date is not known.

The EARS is split in two branches along the eastern and western sides of the Tanzania Craton (Figure 1-1) [*Mulibo and Nyblade*, 2013]. The Eastern Branch extends from northern Tanzania to the Afar depression, and within Kenya is often referred to as the Kenya Rift. It developed almost entirely within the Mozambique Belt. The Western Branch forms the western boundary between Uganda and the Democratic Republic of Congo (DRC) in the north and the boundaries between the DRC, Tanzania and Zambia in the south. The Western Branch consists of a several en echelon fault bounded rift basins interspersed between four mobile belts (Rwenzori, Kibaran, Ubendian, and Irumide) (Figure 1-1) [*Ebinger*, 1989]. The Western Branch is generally considered to be younger, with rifting beginning at about 12 Ma [*Ebinger*, 1989; *Roberts et al.*, 2012]. However, a recent study by *Roberts et al.* [2012] suggested that rifting in southern Tanzania may have coeval with rifting in the Eastern Branch in central Kenya (c.25 Ma). In this study, uplift from plumes or from major plate organization caused the initial development of both branches.

The Western Branch spans from the Aswa Shear Zone (See Section 1.2.3, Figure 1.2) in central Uganda down to Malawi and is comprised of several long, thin lake basins form this including Lake Albert, Lake Edward, Lake Kivu, Lake Tanganyika, Lake Rukwa, and Lake Malawi Basins. Unlike the Eastern Branch, the Western Branch does not have the same progression of volcanism from north to south [*Rosenthal et al.*, 2009]. The rift segments are also less contiguous with apparent offset in places. Additionally, the rift shoulders of these lake basins exhibit a large amount of relief, ranging from 3 to 8 km. It is proposed that the Western Branch expereieced greater subsidence due to the lack of crustal addition from dyke injection.

[*Macgregor*, 2015].

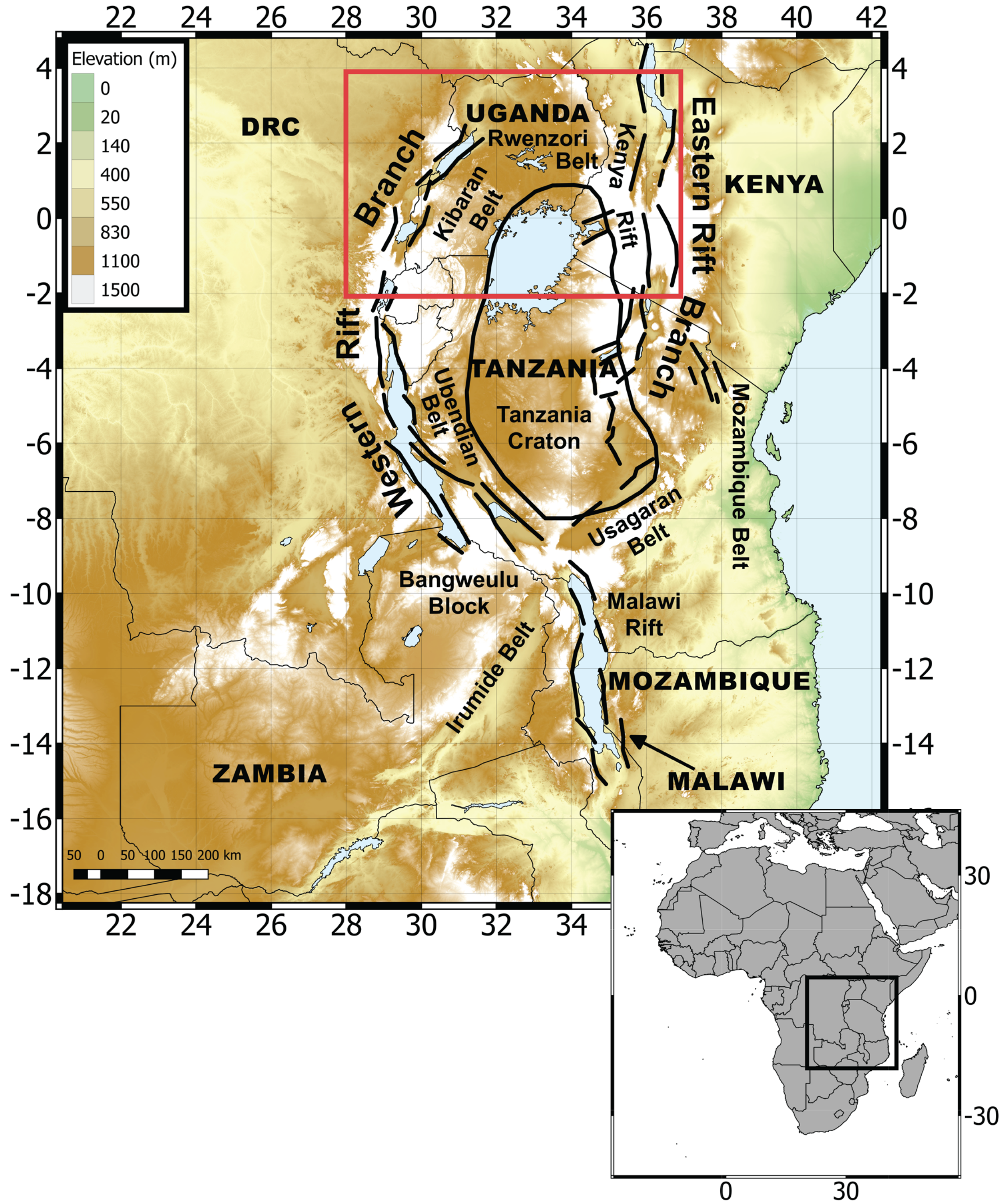

Figure **1-1:** Major geological features of the East African Plateau and Rift System [*O'Donnell et al.*, 2013] overlain on a topographic map. The thick black lines show major rifts and the border of the Tanzania Craton [*Mulibo and Nyblade*, 2013]. The red box indicates the study area.

1.2: Western Kenya and Uganda Geology

1.2.1: The Kenya Rift and Arabian-Nubian Shield

The study area includes the central and northern portions of the Kenya Rift west through northern Uganda (Figure 1-2). Volcanism in the Kenya Rift is believed to be coincident with basin formation and Cenozoic rift faulting [*Ebinger*, 1989]. Volcanism began in northern Kenya at the onset of rifting at about 35-40 Ma [*Macdonald et al.*, 2001], followed by volcanism in the central part of the rift system at 20 Ma and in southern Kenya at about 12 Ma [*Ebinger*, 1989]. The Kenya Rift developed within the Mozambique Belt, which formed during the Neoproterozoic East African orogeny during the final assembly of Gondwana [*Stern*, 1994]. The northern segment of the Mozambique Belt forms part of the Arabian-Nubian Shield, which contains arc and ophiolite terranes accreted onto the Saharan Metacraton to the west [*Fitzsimons et al.*, 2004].

1.2.2: Geological Setting of Uganda

The Saharan Metacraton (Figure 1-2) in northeastern Uganda is recognized as a craton in terms of rheological, geochronological, and isotropic characteristics, but was reworked during the Neoproterozoic East African Orogeny via deformation, metamorphism, and igneous intrusions [*Abdelsalam et al.*, 2002]. To the west of the Saharan Metacraton is the Northern Uganda Terrane [*Westerhof et al.*, 2014], also known as the Ugandan Basement Complex [*Leggo*, 1974]. The Northern Uganda Terrane is part of the Northeastern Congo Block, which is an extension of the Congo craton in northeastern Congo and western Uganda (Figure 1-2) [*Katumwehe et al.*, 2016]. The northern section of the Tanzania Craton extends into southwest Uganda, including the region under Lake Victoria [*Mulibo and Nyblade*, 2013] (Figure 1-2). The Paleoproterozoic Rwenzori

Fold Belt or Buganda-Toro-Kibaran Belt comprises the southwestern portion of Uganda [*Katumwehe et al.*, 2016; *Mulibo and Nyblade*, 2013].

1.2.3: The Aswa Shear Zone

The Aswa Shear Zone (ASZ) is a Neoproterozoic NW-SE-trending structure that runs diagonally though Uganda, separating the Northeastern Congo Block and the Saharan Metacraton (Figure 1-2) [*Katumwehe et al.*, 2016]. *Westerhof et al.* [2014] suggests that the Northeastern Congo Block extends north of the ASZ. However, *Katumwehe et al.* [2016] concludes that this area is part of the Saharan Metacraton.

Westerhof et al. [2014] details a three-stage geodynamic model for the evolution of the ASZ that begins with the Neoproterozoic collision of West Gondwana (containing the proto-Congo craton) and Eastern Gondwana. In this model, the Arabian Nubian Shield acts as an escaping block from the oblique collision. Following this initial stage of development, the combined West and East Gondwana block collides with the Saharan Metacraton in the N-S direction, causing E-W extension along faults that formed in the direction of the ASZ. The last stage involves the final collision of all of the Gondwana plates resulting in the extension of the ASZ northwest into South Sudan and southeast into Kenya, likely sometime between 530 and 400 Ma [*Westerhof et al.*, 2014].

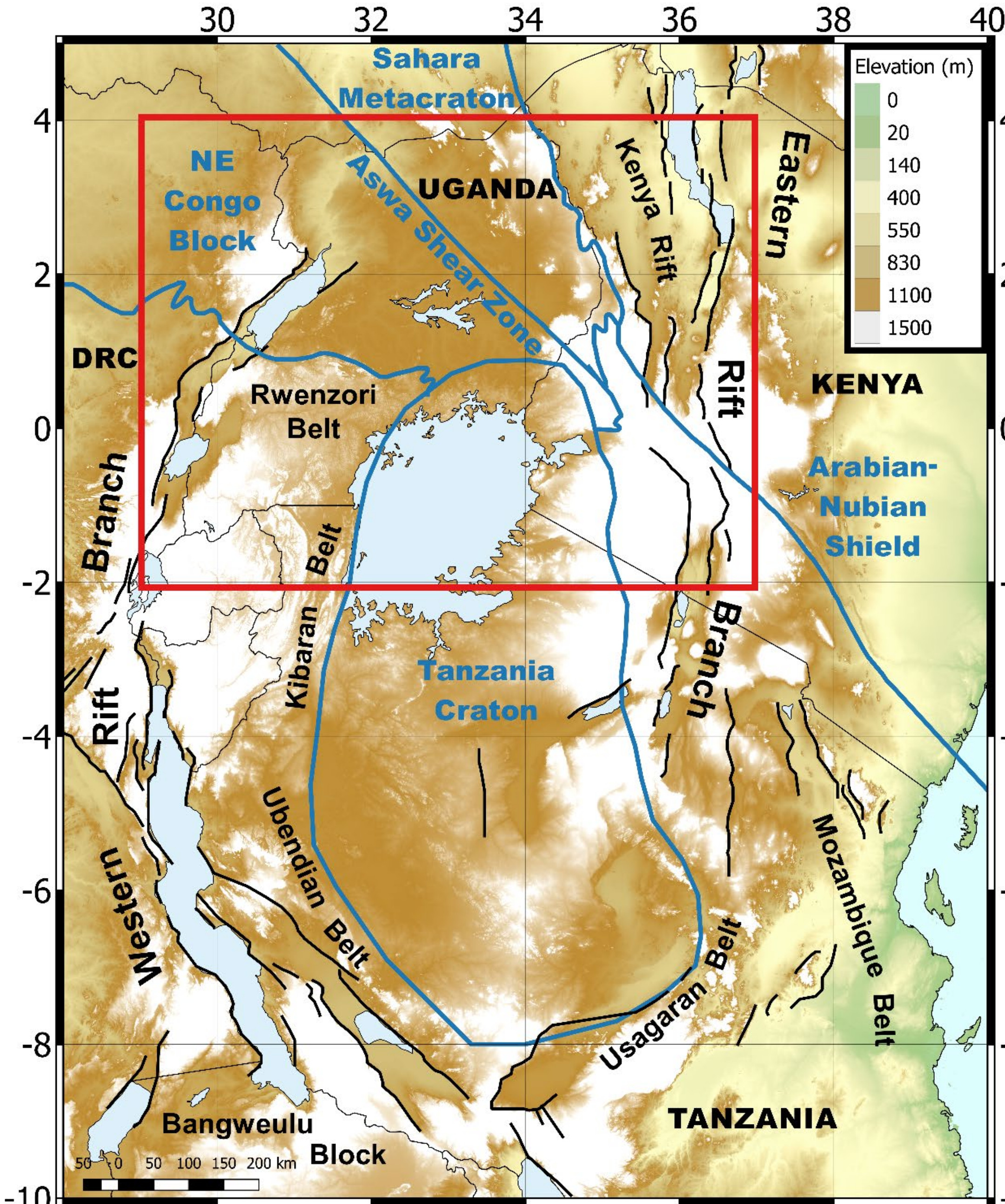

Figure **1-2**: Major geological features of the East Africa Plateau and Rift System [*O'Donnell et al.*, 2013] overlain on a topographic map. Major geological boundaries discussed in this study are in blue. The border of the Tanzania Craton is from *Mulibo and Nyblade* [2013]. The rifts and geological boundaries are from *Katumwehe et al.* [2016]. Red box indicates the study area.

1.3: Review of Previous Tomography Models

1.3.1: Regional Structure

Evidence of seismic anomalies in the mantle structure beneath the EARS can be found in global models from as early as the 1980s [*Dziewonski*, 1984; *Dziewonski and Woodhouse*, 1987]. Many studies have imaged faster upper mantle structure (~100 km – 200 km depth) beneath the Tanzania Craton and slower upper mantle anomalies beneath the rift surrounding the craton [*Adams et al.*, 2012; *Emry et al.*, 2019; *Grijalva et al.*, 2018; *Hansen et al.*, 2012; *Montelli et al.*, 2006; *Mulibo and Nyblade*, 2013; *Park and Nyblade*, 2006; *Ritsema et al.*, 1998]. However the precise extent and structure of the anomalies is an ongoing topic of investigation. *Ritsema et al.* [1999] was one of the earliest regional studies to suggest the possibility that the African superplume caused the Cenozoic rifting, volcanism, and uplift in eastern Africa based on an image of an upper mantle low wave-speed anomaly (LWA) extending at least as deep as the mantle transition zone. The connection between a LWA in the lower mantle beneath southern Africa and LWAs in the upper mantle beneath eastern Africa has been explored in several recent studies [*Grijalva et al.*, 2018; *Hansen et al.*, 2012; *Mulibo and Nyblade*, 2013; *Park and Nyblade*, 2006]. In spite of the large number of previous studies, the structure of the upper mantle beneath the northern section of the East African Plateau and surrounding rifts has not been well imaged to date.

1.3.2: Structure of the Study Area from Previous Models

Park and Nyblade [2006] produced a body-wave tomography model for the central and southern sections of the Kenya Rift from northern Tanzania though central Kenya, extending to depths of 50 km – 300 km. This model shows a LWA of δV_p = -0.5 to -1.5% beneath the Kenya

Rift to 1.5°N latitude. The LWA extends to a depth of 150 km depth before enlarging westward and southward along the edge of the Tanzania Craton to depths greater than 300 km. The authors interpret this anomaly in combination with prior tomography models of Tanzania [*Ritsema et al.*, 1999] and Ethiopia [*Benoit et al.*, 2006] as part of a LWA that dips westward and forms part of the African Superplume. This is an interpretation that is extended by the results of *Mulibo and Nyblade* [2013].

Adams et al. [2012] used Rayleigh wave tomography to generate a shear wave velocity model of the region, and *O'Donnell et al.* [2013] extended this study to include stations in Tanzania and Zambia. The models both identified several fast wave-speed anomalies (FWAs) at depths greater than 100 km. The models showed FWAs underneath the Tanzania Craton/Bangwelu Block, the Rwenzori Belt/Ugandan Basement Complex, and Ubendian/Kibaran Belts. *Adams et al.* [2012] interprets the FWA beneath the Tanzania Craton to continue to the northwest of the ASZ.

In addition to the FWAs, *Adams et al.* [2012] and *O'Donnell et al.* [2013] imaged several LWAs beneath volcanic centers in the Eastern and Western Branch. Shallow (<120 km) LWAs were imaged beneath volcanic centers in the Kenya Rift (through central Kenya), in the Lake Kivu Rift and in the Virunga and Rungwe Volcanic Provinces. These LWAs are consistent with other studies. The LWA beneath the Virunga Volcanic Province has been studied in detail [*Ebinger and Furman*, 2003; *Jakovlev et al.*, 2013; *Wölbern et al.*, 2012]. The anomaly in the Rungwe Volcanic Province has been imaged in detail by *Grijalva et al.* [2018] who proposed that the LWA is the result of warm mantle flow from the African Superplume to the south. The LWA underneath the Kenya Rift in central and southern Kenya has been studied in detail by *Achauer et al.* [1994], *Prodehl et al.* [1997], [*Späth et al.*, 2001] and *Park and Nyblade* [2006], suggesting that the LWA is a continuation of the African superplume with differential extension and onset of rifting..

In a more recent study, *Emry et al.* [2019] imaged several features in the study area using a continental-scale full-wave ambient noise tomography. From 150 km to 200 km depth, the model shows a FWA feature imaged to the west of the Turkana Depression, in the vicinity of the Northern Uganda Terrane. At shallow depths, the model shows average velocities continuing north of the ASZ and west of the Turkana Depression anomaly. The authors interpret this result as the Congo Craton continuing to the southeast. The model also shows low shear wave velocities underneath Lake Turkana at shallow depths from 100 to 150 km. From 150 to 300 km, average shear wave velocities underly the Turkana Depression. Additionally, at deeper depths, the model shows a LWA feature beneath the whole region, but this depth is not well resolved in the model.

Chapter 2

Data and Methodology

2.1: Seismic Networks

The primary dataset used in this study comes from the NE Uganda AfricaArray Network (Figures 2-1, 2-2, XW, doi:10.7914/SN/XW_2017). The nine-station broadband network was deployed from January 2017 to December 2018. Each seismic station included a Streckeisen STS-2 3-component seismometer with a Reftek 130 datalogger, and recorded data at 40 Hz. A list of these stations is found in Appendix A-1. Concurrent data was included from seismic stations from the AfricaArray Network (Figure 2-1 & 2-2, AF, doi:10.7914/SN/AF) (africaarray.org) and the Global Seismic Network (GSN) (Figure 2-1 & 2-2, GSN-II, doi:10.7914/SN/II, GSN-IU, doi:10.7914/SN/IU). A list of these stations can be found in Appendices A-2 and A-3 for the P- and S-wave models, respectively.

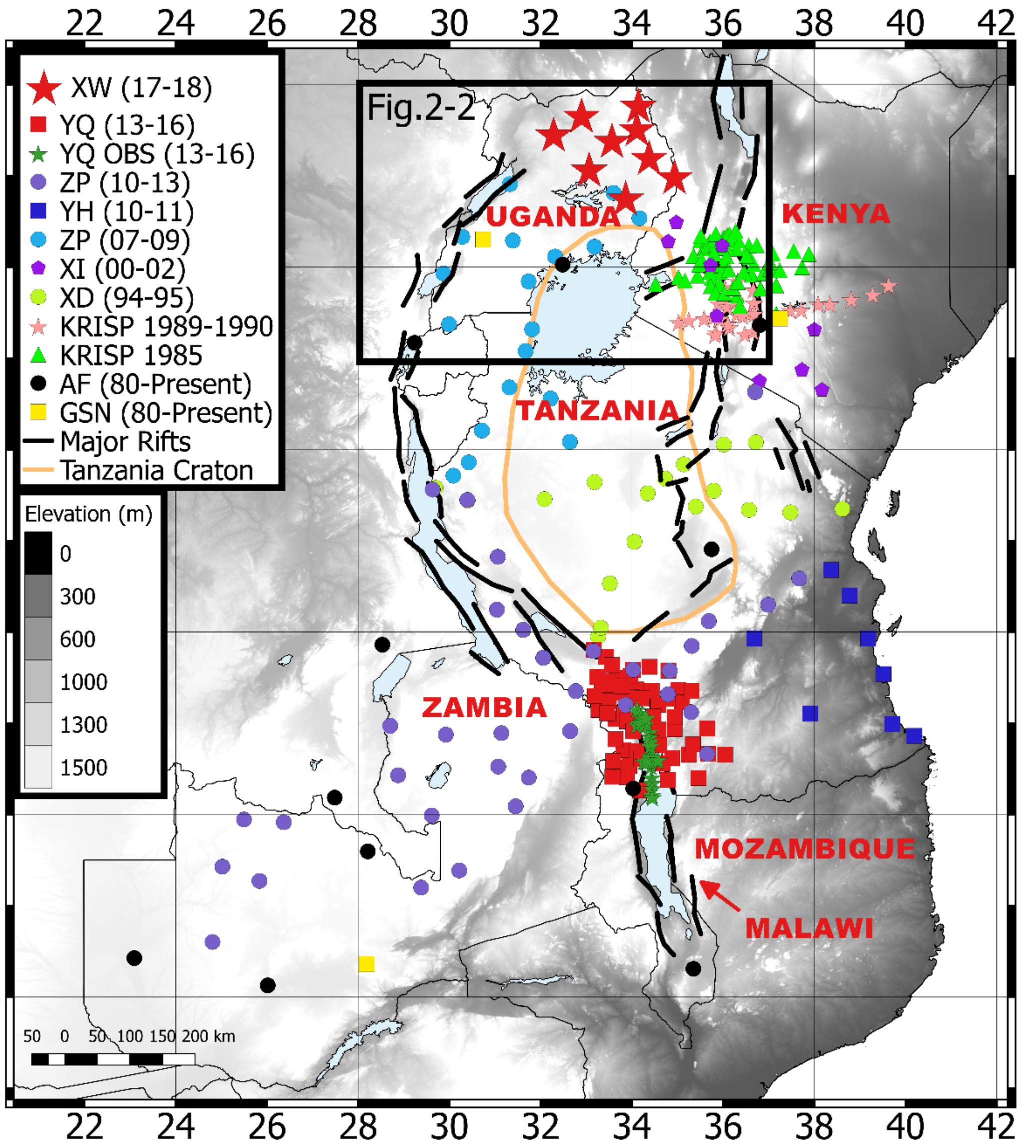

Figure **2-1**: Station map for the NE Uganda ArricaArray Network and nearby stations. Major boundaries are from *Mulibo and Nyblade* [2013]. Box indicates study area shown in Figure 2-2

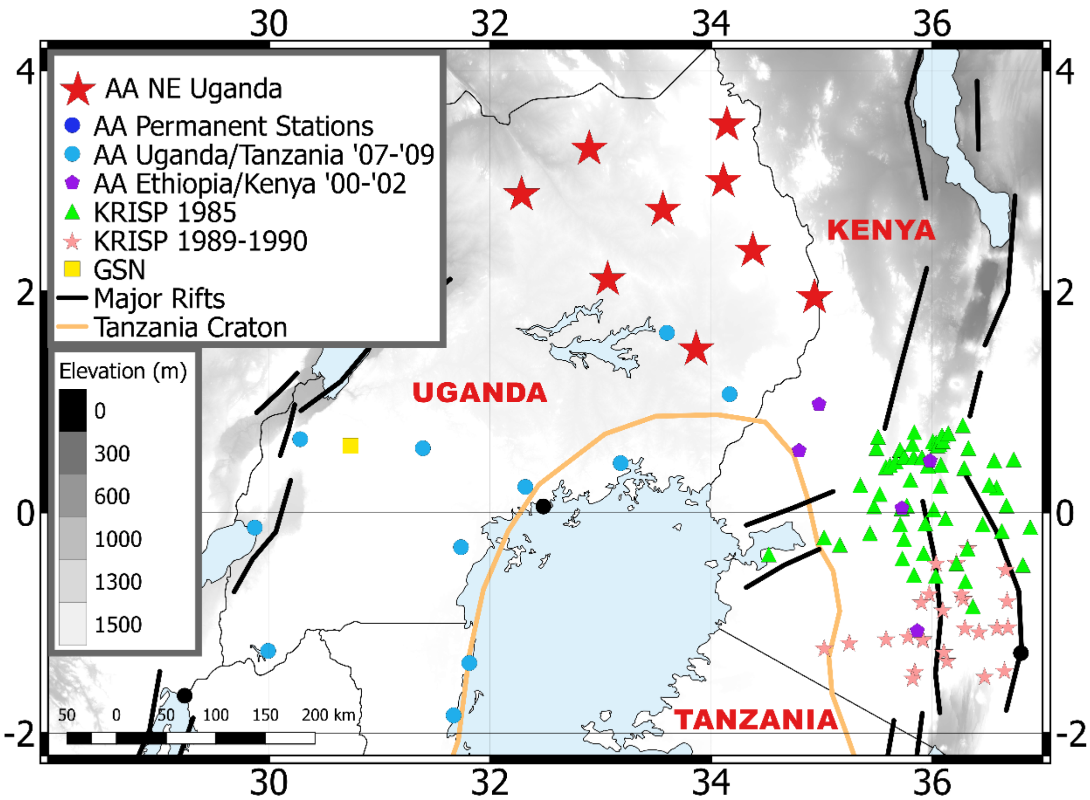

Figure **2-2**: Station map for all networks used in this model. Major boundaries are from *Mulibo and Nyblade* [2013].

In addition to the 2017-2018 networks, data from networks from several prior studies were also included. The SEGMeNT (Study of Extension and magmatism in Malawi and Tanzania) Network consisted of 55 land-based stations, 35 ocean bottom seismometers (OBS), and concurrent permanent stations spanning August 2013 – October 2015 (Figure 2-1, YQ, doi:10.7914/SN/YQ_2013) [*Grijalva et al.*, 2018]. The AfricaArray Basin Experiment (2010-2011) included eight stations along the coast of Tanzania (Figures 2-1 & 2-2, YH, doi:0.7914/SN/YH_2010) [*Tugume et al.*, 2012]. The 4-year (2007-2011) AfricaArray deployment of over 60 stations spans Uganda, Tanzania, and Zambia (Figures 2-1 & 2-2, ZP, doi:10.7914/SN/ZP_2007) [*Mulibo and Nyblade*, 2013]. The Kenya Broadband Experiment (2000-2002) included 10 stations deployed throughout Kenya (Figures 2-1 & 2-2, XI, doi:10.7914/SN/XI_2000) [*Nyblade and Langston*, 2002]. The Tanzania Broadband Experiment

(1994-1995) consisted of 20 stations across Tanzania (Figure 2-1, XD, doi:10.7914/SN/XD_1994) [*Nyblade et al.*, 1996]. And the Kenya Rift International Seismic Project (KRISP) network (1985-1990) including 40 short-period seismic stations deployed in Kenya (Figure 2-1 & 2-2) [*Achauer et al.*, 1994]. Each of these networks also included data from concurrent permanent AfricaArray or GSN Stations when available. A full list of these stations is available in Appendices A-2 and A-3.

2.2: Data Selection

The tomographic method used in this study utilizes data from teleseismic earthquakes at specific distances from each station. From each of the available stations, data from teleseismic earthquakes with $m_b \geq 5.5$ were selected. The data was restricted to 30° to 90° distance for P-waves and 30° to 85° distance for S-waves. Teleseismic events that were recorded at fewer than four stations were omitted. Data from 151 earthquakes for the P-wave model (Figure 2-3A, blue) and data from 135 earthquakes for the S-wave model (Figure 2-3B, blue) recorded on the NE Uganda AfricaArray Network were added to the existing dataset of travel times for eastern Africa. The combined P-wave data set included 30,533 travel times from 2,316 earthquakes. The combined S-wave data set included 14,608 travel times from 1,477 earthquakes. Both P- and S-wave datasets have good azimuthal coverage (Figure 2-3). List of all events used are given in Appendix A-4 (P-model) and A-5 (S-model).

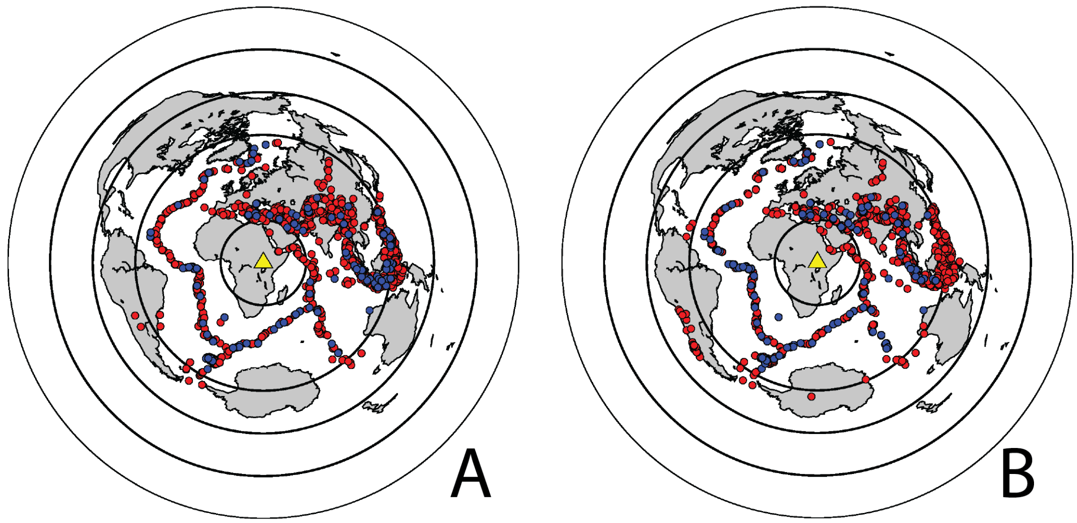

Figure **2-3**: Event distribution maps for events used in (A) the P-wave model and (B) the S-wave model. The yellow triangle represents the center of the study area. Red circles show the event locations from previous networks (1985-2015) and the blue circles show event locations from the NE Uganda AfricaArray Network (2017-2018). Circles are plotted at intervals of 30° from the center of the study area.

2.3: Multichannel Cross Correlation Method (MCCC)

The teleseismic data were used to determine relative P- and S-wave arrival times to construct the body-wave tomography models. The multichannel cross correlation method (MCCC) developed by *VanDecar and Crosson* [1990] was used to estimate relative arrival times from manual picks of the phase-arrival on each seismogram. Prior to picking the phase, the data were filtered using a zero-phase Butterworth filter with corner frequencies of 0.5 Hz - 2 Hz for P-waves and 0.04 Hz – 0.1 Hz for S-waves. Theoretical P-wave arrival times and S-wave arrival times were calculated for each seismogram using the IASPI91 [*Kennett*, 1991] global reference velocity model (Figure 2-4).

After noting the theoretical arrival time, each seismogram was then analyst picked for P- and S-wave arrivals (Figure 2-4). Because the picks must be coherent across stations for each event, noisy station-event pairs were omitted.

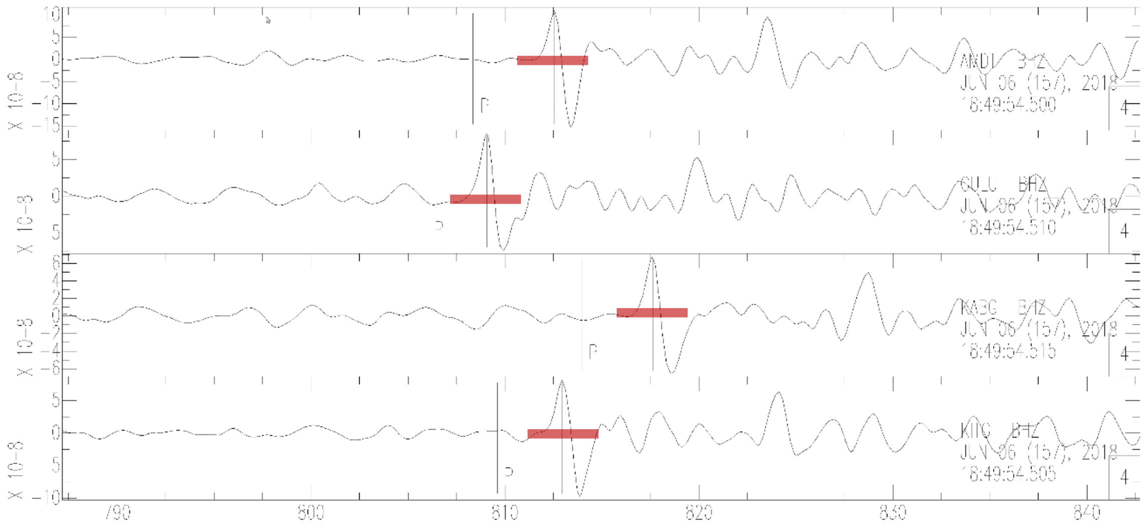

Figure **2-4**: Example of filtered P-wave recorded on NE Uganda AfricaArray Network stations. The P-marker designates the predicted arrival using the IASPI91 model. The unlabeled marker indicates the manual pick. The red bar shows the 3 second window that is used in the cross-correlation.

The MCCC method uses a 3-second window around the P-wave and 12-second window around the S-wave phase arrival picks, and searches for the peak of the cross-correlation function, which is then used to determine the relative delay times. A least squares solution is used to optimize the arrival time for each seismogram. Relative arrival time residuals are solved for using Equation 2.1, where res_{ij} is the residual for seismograms *i* and *j*, Δt_{ij} is the relative arrival-time between station pairs, and t_i and t_j are the arrival times for seismograms *i* and *j*. The standard deviation is given by Equation 2.2, where σ_i is the standard deviation for the *i*th seismogram and *n* is the number of stations. The residuals t_{RES} for each event are calculated using Equation 2.3, where t_i is the arrival time for the *i*th station, t_{e_i} is the expected arrival time based on the IASP91 model, and $\bar{t}_e$ is the mean of the expected arrival for all the travel times for the event.

$$res_{ij} = \Delta t_{ij} - (t_i - t_j) \tag{2.1}$$

$$\sigma_i = \sqrt{\frac{1}{(n-2)} \sum_{i \neq j} res_{ij}^2} \tag{2.2}$$

$$t_{RES_i} = t_i - (t_{e_i} - \bar{t_e}) \tag{2.3}$$

This resulting data set of relative travel time residuals are from events recorded at different times and on different networks. In order to ensure the absence of a static shift between relative travel times between various networks, the residuals for several co-located stations (KMBO, TEBE, and MBAR) were plotted against back azimuth and distance (Appendices B-11 and B-12). There are no systematic differences in the residuals from previous studies and this one.

2.4: Model Parameterization and Inversion

The travel-time residuals were inverted using the method from *VanDecar* [1991]. The method uses a model parameterized with B-splines under tension (Figure 2-5). A grid of knots was used to create the model. Knots are spaced more densely in the main study area and more sparsely in other areas. There are 82 total knots in the latitudinal direction and 78 knots in the longitudinal direction, spaced at 1/3° intervals in the dense area, and 1° elsewhere. There are 36 knots in the radial direction at intervals of 25 km from 0-200 km depth, 33.3 km intervals from 200-700 km depth, 50 km intervals from 700-1000 km depth, and 100 km from 1000-1600 km depth. The model has a total of 230,256 knots.

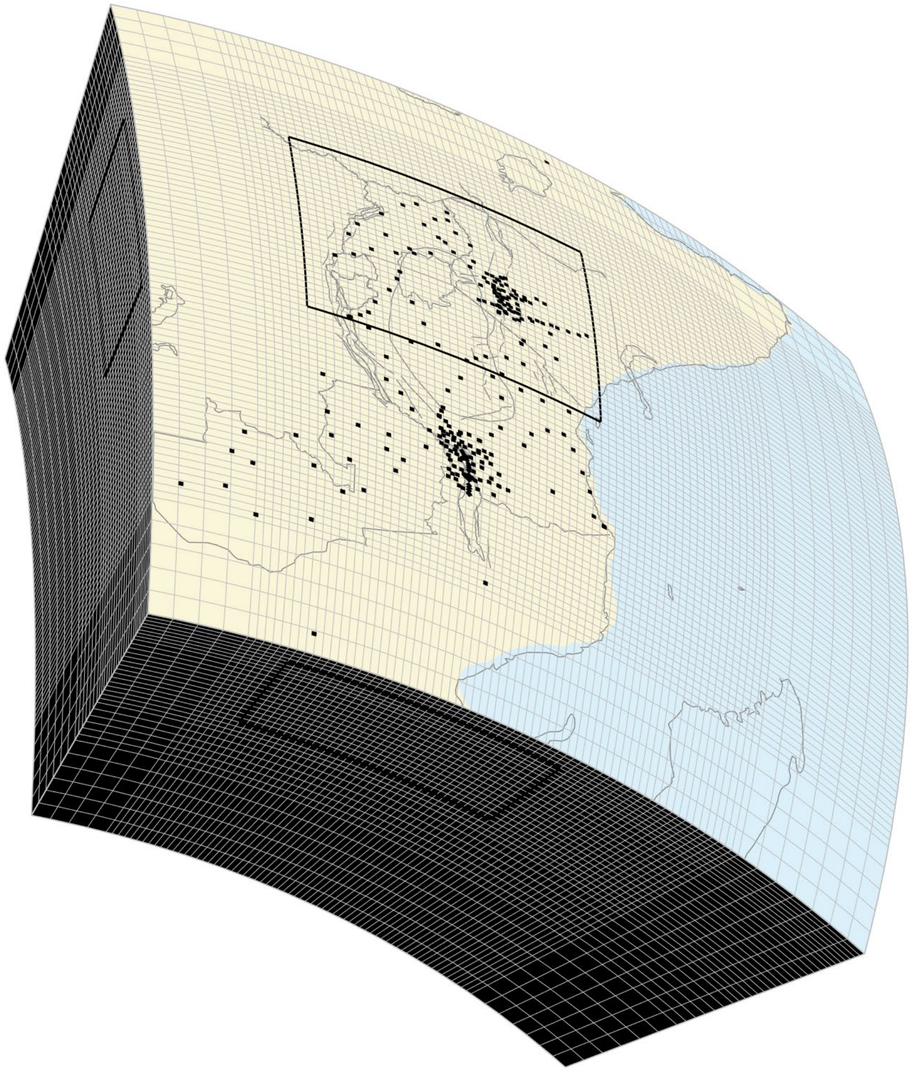

Figure **2-5**: Visual representation of the model parameterization used in this study. Knots are densely spaced in the main study area, and less densely spaced towards the edge of the model. The black box represents the focus area of this study.

VanDecar's method simultaneously inverts for slowness perturbations, source terms, and station terms. The source terms account for heterogeneities outside the model and event origin errors while the station terms account for heterogeneity below a station where crossing raypath coverage is limited. The un-weighted equation for the travel-time for the i^{th} ray through the model is given by Equation 2.4. The residuals from these travel-times are determined by the difference between the observed arrival times (described in Sections 2.2 and 2.3) and travel-times determined from raytracing through the IASPI91 reference model. The resulting system is overdetermined, and therefore lacks a unique solution.

$$P_{ij}^{(k-1)}\Delta s_j^{(k)} + h_r^{(k)} + e_q^{(k)} = \Delta t_i^{(k-1)} \tag{2.4}$$

$where$:

$P_{ij}^{(k-1)} = \left[\frac{\partial t_i}{\partial s_j}\right]_{s=s^{(k-1)}}$

$\Delta s_j^{(k)}$ is the slowness perturbation to $s^{(k-1)}$ at knot j

$h_r^{(k)}$ is the time correction for station r at iteration k (aka station term)

$e_q^{(k)}$ is the time correction for event q at iteration k (aka event term)

$\Delta t_i^{(k-1)}$is the travel-time residual for the i[th] ray relative to the model at iteration (k-1)

To address the issue of nonuniqueness, regularization parameters (smoothing and flattening) are used to obtain a solution with the least amount of structure. A larger smoothing weight, λ, prioritizes the smoothness of the model over fitting of the travel time residuals[*VanDecar and Crosson*, 1990]. Flattening refers to the minimization of the slowness perturbation gradient [*Sambridge and Faletič*, 2003]. The objective in selecting regularization parameters is to avoid overfitting structure in the model while minimizing the misfit to the travel-time residuals. The amount of structure is given by the model 'roughness', or the rms misfit to the constraint equations, given by Equation 2.5. The misfit to the structure is determined using an rms travel-time residual reduction. This is determined as a percent difference between the initial rms misfit residuals and the rms residuals for the final iteration of the inversion (Equation 2.6). The calculation of the rms residual reduction depends on the original iteration of the inversion, and thus is not a representation of the covariance of the system itself, but instead gives us an idea of the point at which the addition of additional structure into the model results in small returns in terms of rms travel-time residual misfit [*VanDecar and Crosson*, 1990].

$$\sigma_f^{(k)}(\lambda) = \sqrt{\frac{1}{m}\sum_{i=1}^{m}\left[F_{ij}\Delta s_j^{(k)}(\lambda)\right]^2} \tag{2.5}$$

$where$:

$\sigma_f^{(k)}(\lambda)$ is the model 'roughness' at iteration k and smoothing parameter λ

F_{ij} is the filter matrix for knot at location (i, j) [latitude, longitude]

$\Delta s_j^{(k)}$ is the slowness perturbation to $s^{(k-1)}$ at iteration k

$$\frac{\sigma_{tt}^{(0)} - \sigma_{tt}^{(k)}(\lambda)}{\sigma_{tt}^{(0)}} \tag{2.6}$$

$where$

$\sigma_{tt}^{(0)}$ is the initial rms misfit to the travel-time equations

$\sigma_{tt}^{(k)}(\lambda)$ iis the rms misfit for iteration k and smoothing parameter λ

To determine the optimal regularization parameters, trade-off curves have been constructed for both the P-wave model (Figure 2-6, Table 2-1) and S-wave model (Figure 2-7, Table 2-2). The combination of smoothing and flattening parameters closest to the bend of the curve is adopted for the final model because it balances maximizing the fit to the residuals while minimizing the amount of structure in the model. The P-wave model is inverted using a smoothing of 120,000 and flattening of 5,000 resulting in a 93.37% reduction in the misfit of the residuals compared to the misfit for the original model. The S-wave model uses smoothing of 100,000 and flattening of 4,000 resulting in a 89.11% reduction in the misfit of the residuals compared to the misfit for the initial (IASPI91) model.

As discussed, the results of this trade-off curve rely on the comparison with the initial model. However, the initial model includes the station and source terms. In order to explore the amount of contribution of the station and source terms in the covariance of the model, we developed a 1D model including these terms by maximizing both smoothing and flattening to approximate a model where these parameters are effectively infinite. The travel time residuals from the resulting model were used in place of $\sigma_{tt}^{(0)}$ and a flattening of 999,999 was used in place of λ for the reference model. The results show that approximately 50% of the fit to the travel time residuals for the P-wave model and 45% of the fit to the travel-time residuals for the S-wave model is accounted for by the station and source terms (Tables 2-3, 2-4 and Figures 2-8, 2-9).

Table **2-1**: Input parameters for P-wave model trade-off curve. Inversion was performed for varying combinations of smoothing and flattening to optimize RMS travel-time reduction while minimizing RMS model roughness. The values in red are the values chosen for the final model, based on the trade-off curve (Figure 2-6).

RMS TT Reduction (%)	**RMS Model Roughness (s/km)**	**Smoothing**	**Flattening**
92.9545	4.13E-08	140000	10000
93.5985	1.53E-07	100000	2000
93.5227	1.03E-07	100000	4000
93.5606	1.16E-07	80000	4000
93.4091	7.27E-08	100000	6000
93.447	7.88E-08	80000	6000
93.2197	5.27E-08	60000	8000
93.3333	6.08E-08	120000	8000
93.3712	**6.69E-08**	**120000**	**5000**

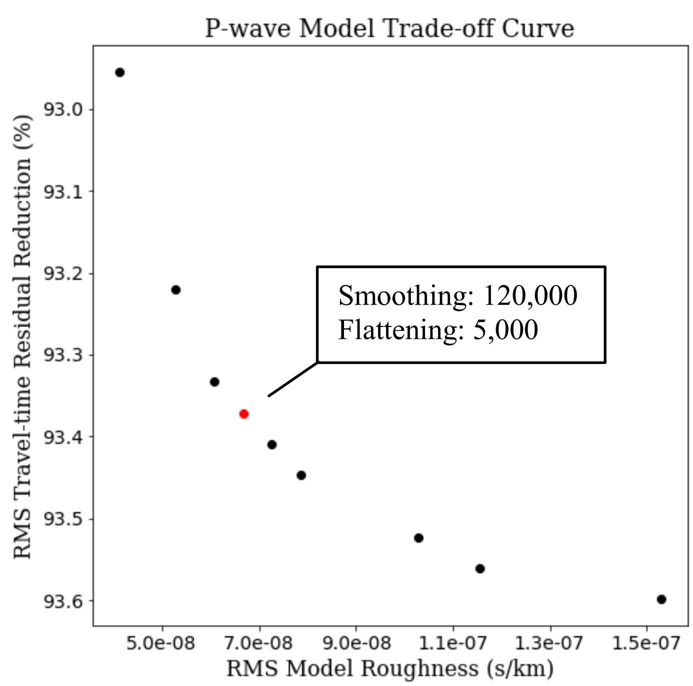

Figure **2-6**: Trade-off curve for the P-wave model. Values plotted are from Table 2-1. The red point is the inversion parameters chosen for the final model, based on the trade-off curve.

Table **2-2**: Input parameters for S-wave model trade-off curve. Inversion was performed for varying combinations of smoothing and flattening to optimize RMS travel-time reduction while minimizing RMS model roughness. The values in red are the values chosen for the final model, based on the trade-off curve (Figure 2-7).

RMS TT Reduction (%)	**RMS Model Roughness (s/km)**	**Smoothing**	**Flattening**
88.0521	9.86E-08	140000	10000
89.5092	4.10E-07	100000	2000
89.3252	3.41E-07	120000	2000
89.9693	6.45E-07	60000	2000
88.9877	2.34E-07	120000	4000
89.2331	3.04E-07	80000	4000
88.681	1.70E-07	120000	6000
88.5429	1.54E-07	60000	8000
89.1104	**2.66E-07**	**100000**	**4000**

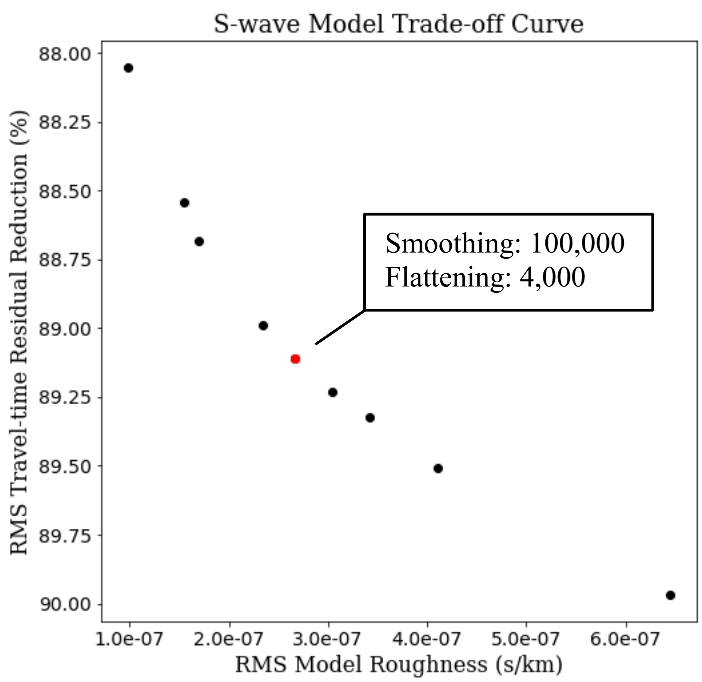

Figure **2-7**: Trade-off curve for the S-wave model. Values plotted are from Table 2-2. The red point is the inversion parameters chosen for the final model, based on the trade-off curve.

Table **2-3**: Input parameters for P-wave model trade-off curve for 1D model. Initial Inversion performed with maximum smoothing and flattening to create 1D model. The 1D model was used as a comparison to compute the RMS travel-time reduction for varying combinations of smoothing and flattening (Table 2-1) to determine the percentage of the travel-time reduction is due to station terms, source terms and earthquake relocations. The values in red are the values chosen for the final model, based on the trade-off curve (Figure 2-8).

RMS TT Reduction (%)	RMS Model Roughness (s/km)	Smoothing	Flattening
44.4776	4.13E-08	140000	10000
49.5522	1.53E-07	100000	2000
48.9552	1.03E-07	100000	4000
49.2537	1.16E-07	80000	4000
48.0597	7.27E-08	100000	6000
48.3582	7.88E-08	80000	6000
46.5672	5.27E-08	120000	8000
47.4627	6.08E-08	60000	8000
47.7612	**6.73E-08**	**120000**	**5000**

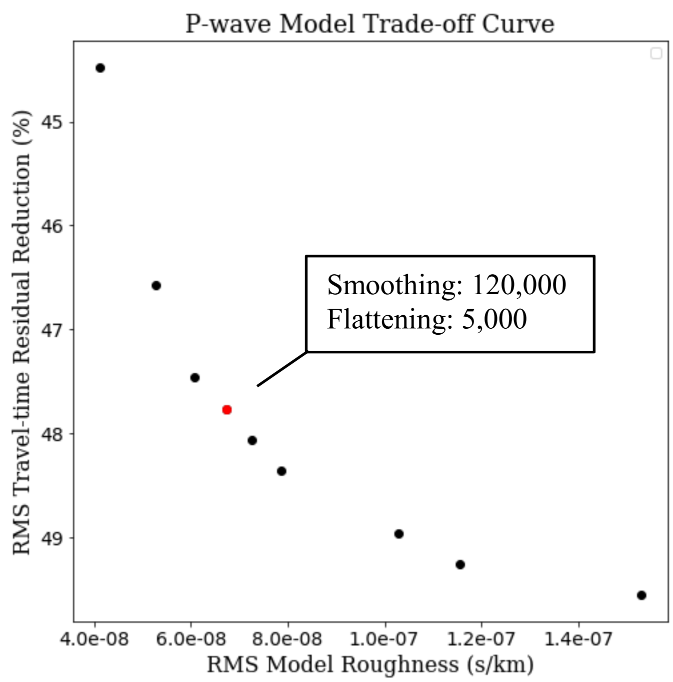

Figure **2-8**: Trade-off curve for the P-wave model reduction due to the effects of station terms, source terms and earthquake relocations. Values plotted are from Table 2-3. The red point is the inversion parameters chosen for the final model, based on the trade-off curve.

Table **2-4**: Input parameters for S-wave model trade-off curve for 1D model. Initial Inversion performed with maximum smoothing and flattening to create 1D model. The 1D model was used as a comparison to compute the RMS travel-time reduction for varying combinations of smoothing and flattening (Table 2-2) to determine the percentage of the travel-time reduction is due to station terms, source terms and earthquake relocations. The values in red are the values chosen for the final model, based on the trade-off curve (Figure 2-9).

RMS TT Reduction (%)	RMS Model Roughness (s/km)	Smoothing	Flattening
38.1746	9.86E-08	140000	10000
45.7143	4.10E-07	100000	2000
44.7619	3.42E-07	120000	2000
48.0952	6.45E-07	60000	2000
43.0159	2.34E-07	120000	4000
44.2857	3.04E-07	80000	4000
41.4286	1.70E-07	120000	6000
40.7143	1.54E-07	60000	8000
43.6508	**2.66E-07**	**100000**	**4000**

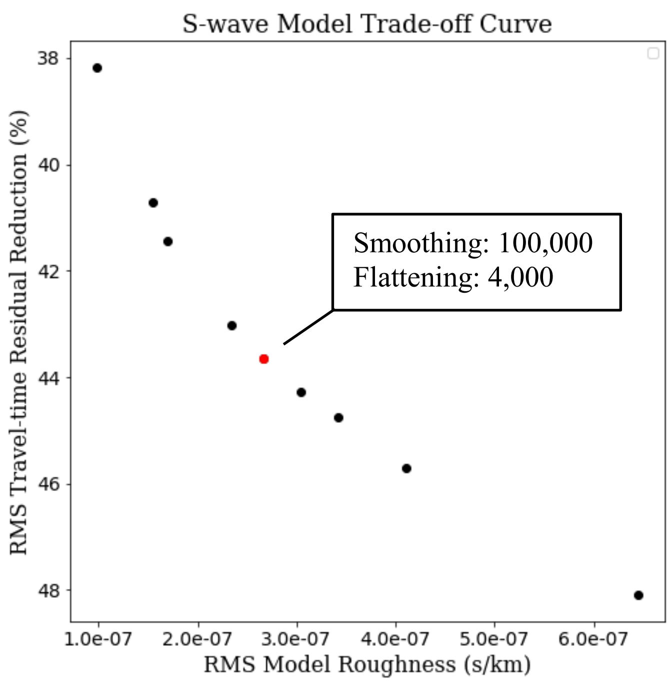

Figure **2-9**: Trade-off curve for the S-wave model reduction due to the effects of station terms, source terms and earthquake relocations. Values plotted are from Table 2-4. The red point is the inversion parameters chosen for the final model, based on the trade-off curve.

Chapter 3

Body-wave Tomography Results

3.1: Travel Times

Cross-correlation derived delay times for four events from 2017-2018 are shown in Figure 3-1 and 3-2 for the P- and S-wave model, respectively. The delay times are defined in Equation 3.1, as the difference between the preliminary travel time estimates based on the IASPI91 model and the lag time between traces at the maximum magnitude of the cross-correlation function. Events were selected for a suite of back azimuths to illustrate differences in P-wave and S-wave delay times due to event location relative to the network. Delay times are typically positive (late) or very marginally negative (early) in northeast Uganda when the event is arriving from the north. The average range in travel time residuals for P-waves is ± 5 s and the range for S-waves is ±15 s.

$$\Delta t_{ij} = t_j^p - t_i^p - \tau_{ij}^{max} \tag{3.1}$$

$where$:

Δt_{ij} is the cross-correlation derived delay time between the ith and jth traces

t_j^p, t_i^p are preliminary arrival time estimates for the ith and jth traces

τ_{ij}^{max} is the lag time relative to preliminary estimates at the maximum magnitude of the cross-correlation function

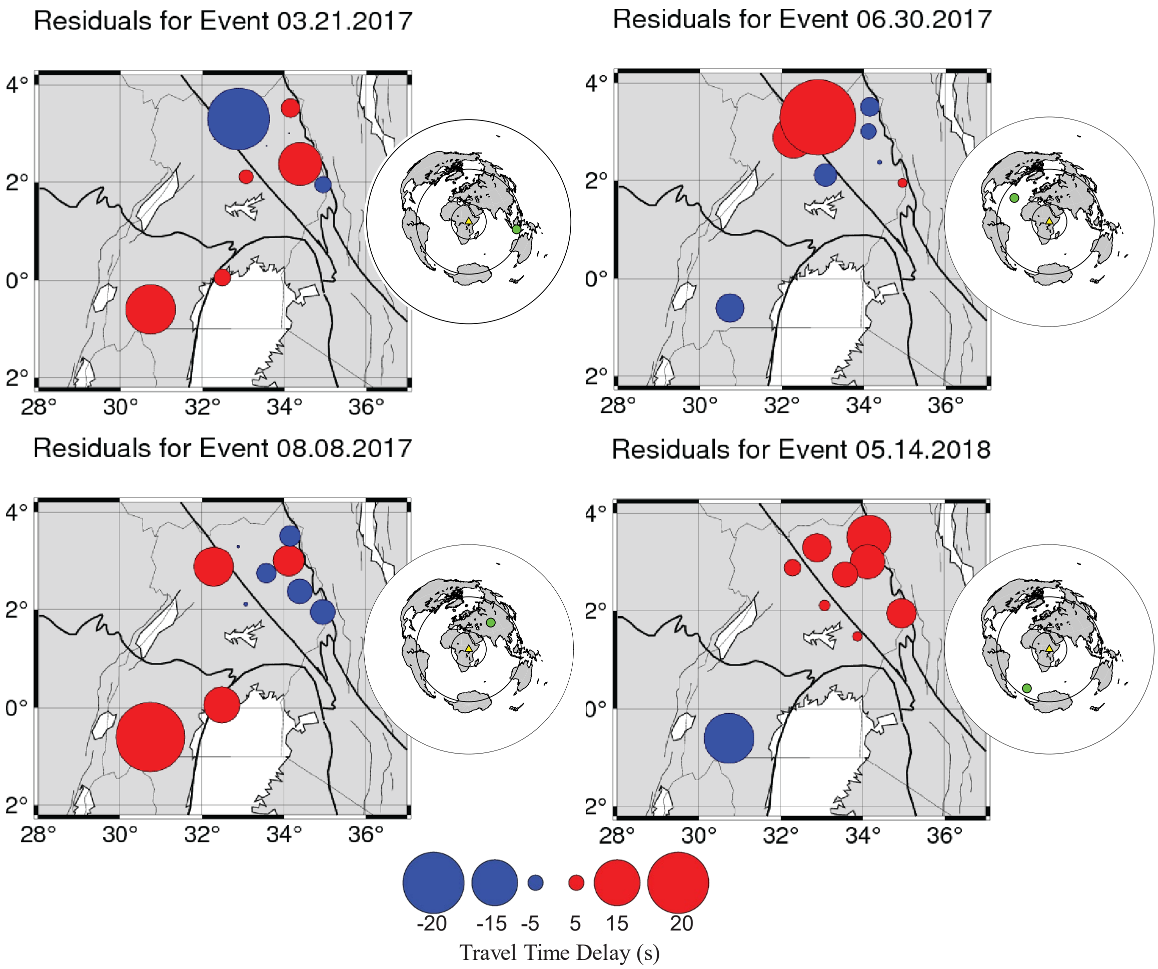

Figure **3-1**: P-wave delay times for four events from 2017-2018. Inset map shows the location of the event (green dot). Circles are shown at distances of 30° and 90° away from the center of the network to indicate the range of teleseismic events. Geology is from *Katumwehe et al.* [2016] and *Mulibo and Nyblade* [2013].

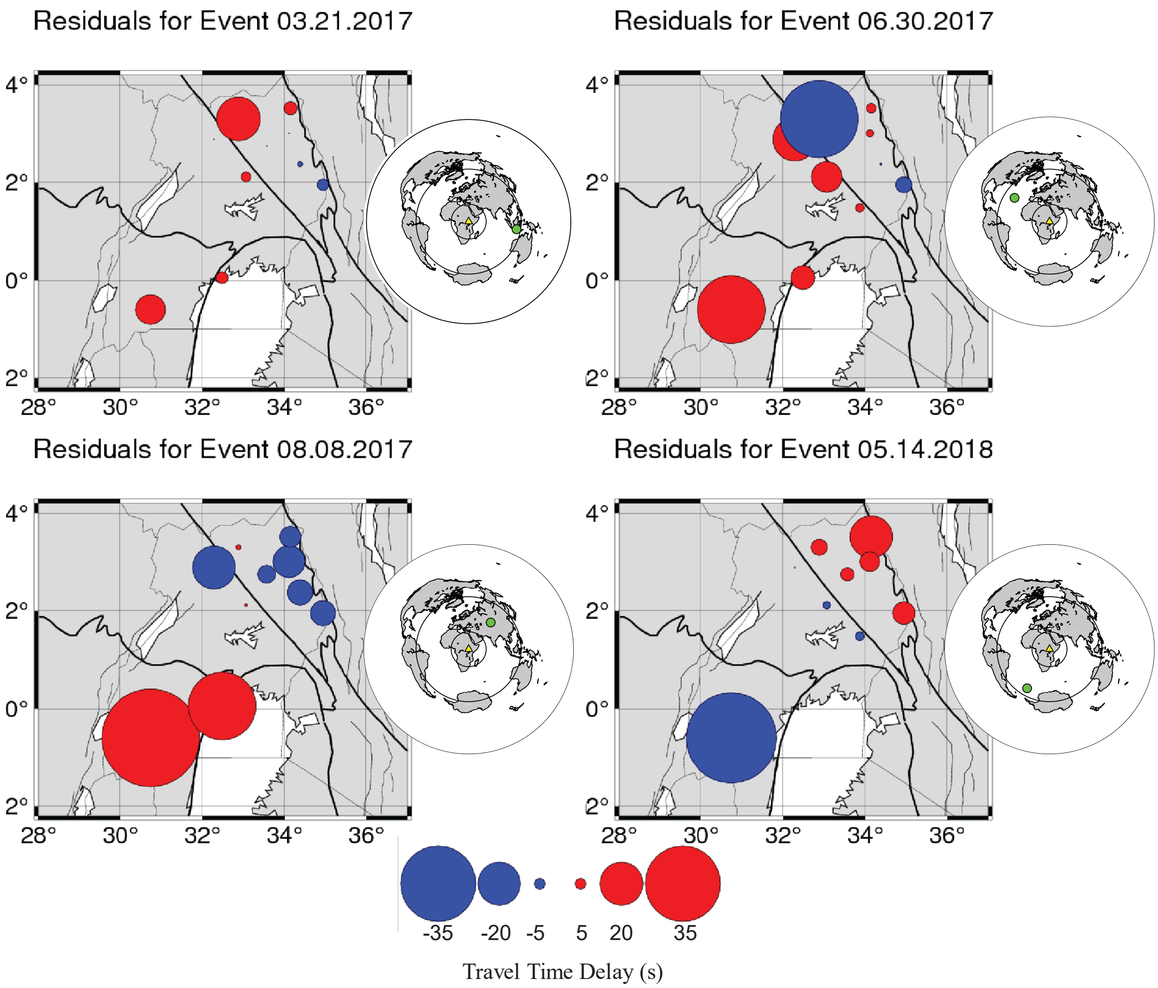

Figure **3-2**: S-wave delay times for four events from 2017-2018. Inset map shows the location of the event (green dot). Circles are shown at distances of 30° and 85° away from the center of the network to indicate the range of teleseismic events. Geology is from *Katumwehe et al.* [2016] and *Mulibo and Nyblade* [2013].

The station terms ($h_r^{(k)}$, Section 2.4, Equation 2.4) for the P-wave and S-wave body wave tomography model are shown in Figure 3-3 and 3-4, respectively. The station terms are fairly small for both models at around ±0.1 seconds average for the P-wave model and ±0.25 seconds for the S-wave model. The station terms are highest in southern Kenya for the P-wave model and southern Kenya/northern Tanzania for the S-model (around -2 to -5°, ~37°). The station terms are, on average, positive for this area. Positive station terms indicate an increase in the travel-time residuals due to a station correction. Since station terms may be due to heterogeneity beneath the station, these positive station terms may be due to volcanics or sediments in the rift basin. The NE Uganda AfricaArray Network stations are slightly negative (~-0.1 seconds) in the P-wave model but slightly positive (~-0.15 seconds on average) in the S-wave model, however both are relatively small compared to the observed delay times, so the difference may not be significant. These findings are consistent with station terms from earlier models [*Grijalva et al.*, 2018; *Mulibo and Nyblade*, 2013; *Park and Nyblade*, 2006; *Ritsema et al.*, 1998].

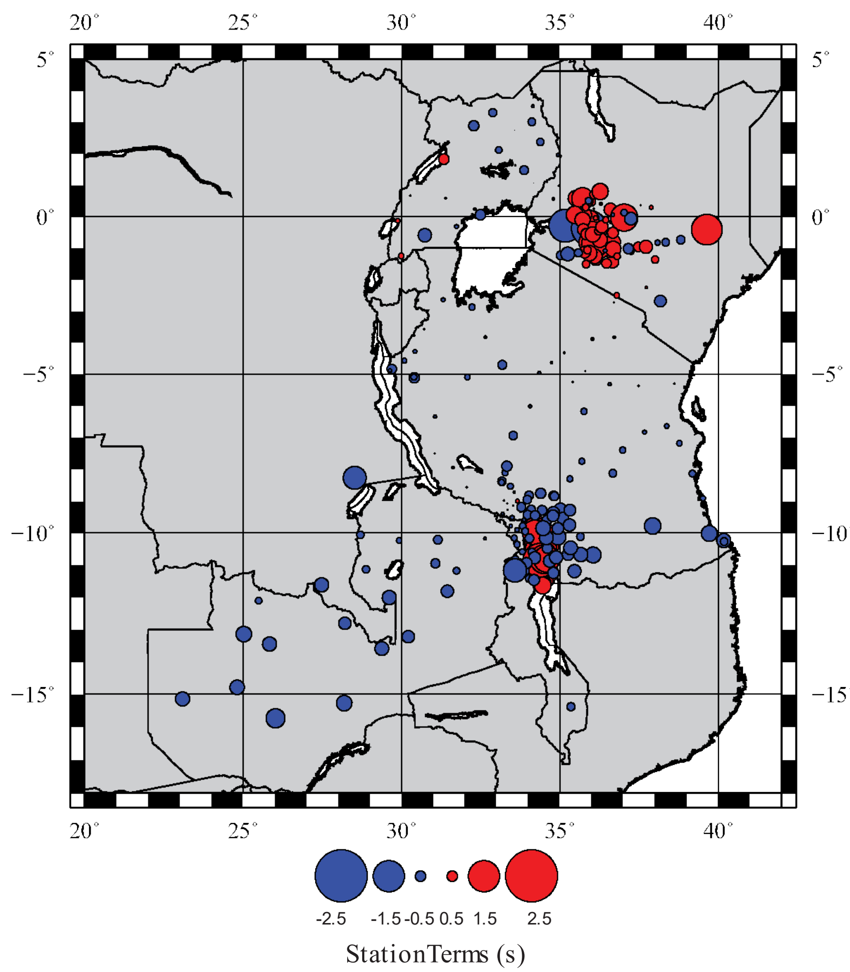

Figure **3-3**: Station terms for the P-wave tomography model.

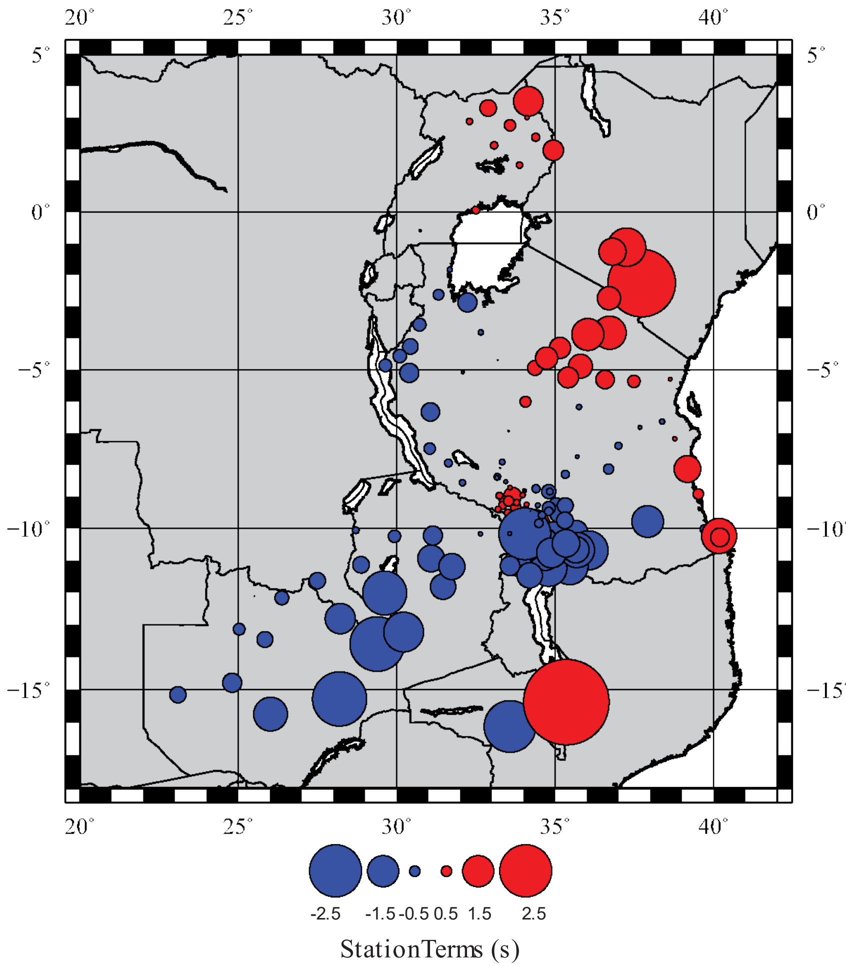

Figure **3-4**: Station terms for the S-wave tomography model.

3.2: P-model Body-wave Tomography Results

3.2.1: Model Results

The model shows similar upper mantle structure to previous models [*Grijalva et al.*, 2018; *Mulibo and Nyblade*, 2013; *Park and Nyblade*, 2006] in areas where the models overlap spatially (Figure 3-5). Resolution above 100 km is limited (see results in Sections 3.2.2 & 3.3.2), so only model results below 100 km are shown . The model extends the imaging of upper mantle beneath eastern Africa into areas in northern and northeastern Uganda. One of the new major features is a prominent low wave-speed anomaly (LWA) of δVp = ~-0.5 – -1.2% in northeastern Uganda (Anomaly B, Figures 3-5, 3-6, Appendix B-1). The LWA is approximately 80 km wide (E-W) and 100-300 km long (N-S) (Figures 3-3, 3-4, Appendix B-1) and extends from 100 km to depths of at least 500 km, possibly 800 km. However, the LWA from 500 km to 800 km may be a discrete structure (Figure 3-6, Appendix B-1). The structure dips to the east with an apparent dip of approximately 60°. Vertical cross sections through the model suggest that the structure may connect to the prominent LWA beneath the Kenya Rift imaged by previous studies [*Grijalva et al.*, 2018; *Mulibo and Nyblade*, 2013; *Park and Nyblade*, 2006]. To the west of this LWA in northern Uganda, a fast wave-speed anomaly (FWA) of δVp = ~0.5 – 1.2% is imaged, and is an extension of the FWA previously imaged to the south beneath the Tanzania Craton (Anomaly A, Figures 3-5, 3-6, Appnedix B-1) [*Grijalva et al.*, 2018; *Mulibo and Nyblade*, 2013; *Park and Nyblade*, 2006].

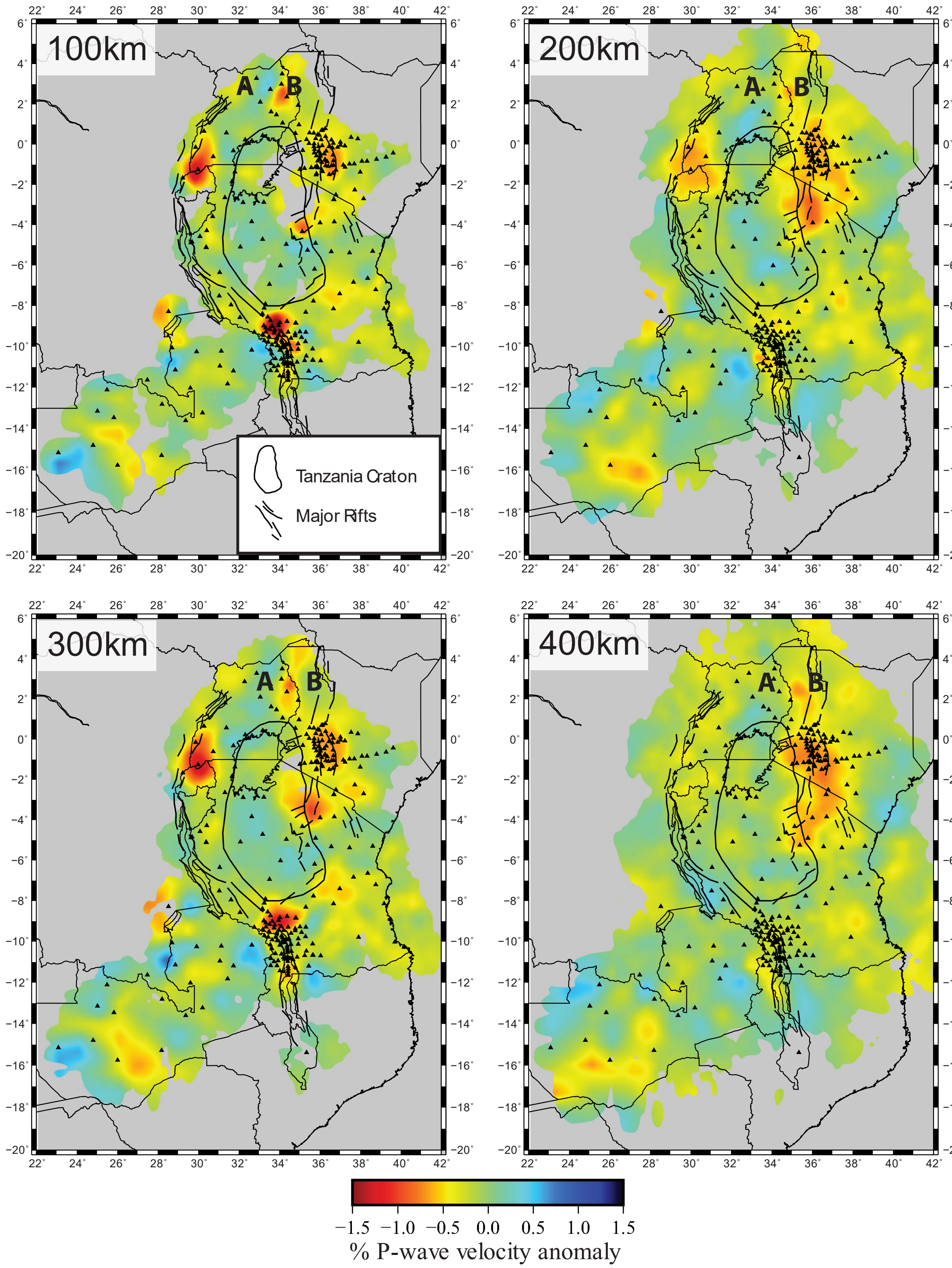

Figure **3-5**: Horizontal sections through the P-wave tomography model at 100 km to 400 km depths. Geological features are from *Mulibo and Nyblade* [2013]. Triangles are stations used in the model.

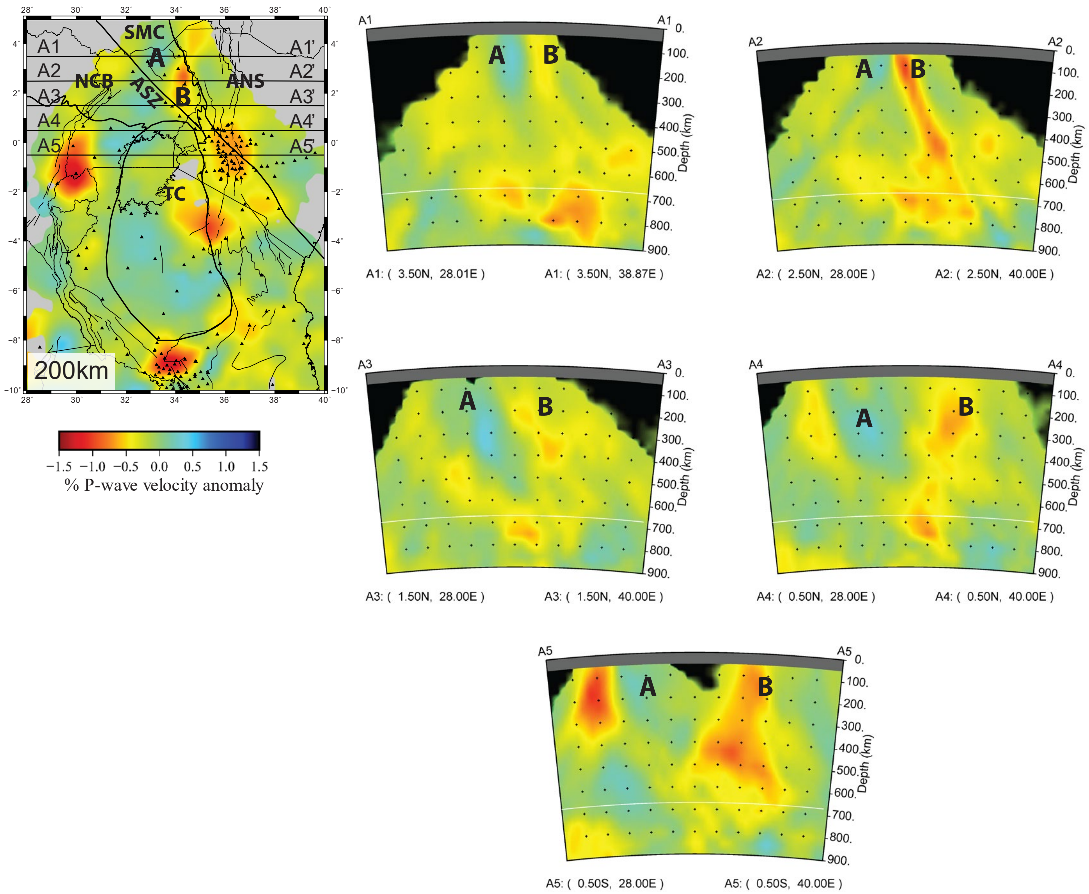

Figure **3-6**: Vertical sections from the P-wave tomography model. Index map at 200 km depth shows the location of the depth slices. The slices show the low-wave speed anomaly (LWA, "B") from A-1 through A-3. A-4 and A-5 show major LWA structures previously described in *Mulibo and Nyblade* [2013]. A fast wave-speed anomaly (FWA, "A") is apparent in the center of the cross sections A1 – A5 in central Uganda. Geology shown in left panel is from *Katumwehe et al.* [2016] and *Mulibo and Nyblade* [2013]. Triangles are stations used in the model. NCB – North Congo Block, SMC – Saharan Metacraton, ANS – Arabian-Nubian Shield, TC – Tanzania Craton, ASZ – Aswa Shear Zone.

3.2.2: Resolution Tests

The resolution of the body-wave tomography models have been evaluated using checkerboard tests of alternating ±5% velocity anomaly spheres of 100 km diameter and 200 km diameters centered at 100 km intervals from 100 km depth to 600 km depth (Figure 3-7). The raypaths from the model were used to generate synthetic travel time delays. Noise was added as a random time error with Gaussian distribution and a standard deviation of 0.04 s. The inversion was run using the synthetic travel time delays from the checkerboard model along with the same parameterization and regularization parameters as the original model. The degree of recovery or similarity of the input model to the output model represents the degree of resolution in the original model for structures in the same location and of the same size.

The 200 km diameter checkerboard model is well resolved at depths greater than 100 km for most of the model extent, except near some of the boundaries. The 200 km diameter checkerboard model shows a strong degree of recovery within the study area in Uganda and, at some depths, in western Kenya as well (Figure 3-8). The 100 km diameter checkerboards do not show the same degree of resolution throughout the model extent but are well resolved in the location of the new low wave-speed anomaly (Anomaly B) described in the previous section (Figure 3-9). These results indicate that in the horizontal direction, Anomaly B is well resolved to a width of 100 km, which is approximately the same size as the anomaly as imaged in the original model (Figures 3-5,3-6, Appendix B-1).

The vertical resolution of the model is more limited than the horizontal resolution. Figure 3-10 shows the checkerboard model output in map view alongside cross sections for the input and output for the A5-A5’ profile at depths of 200 km to 600 km. The amount of vertical smearing ranges from approximately 100 km at the depth of 200 km to approximately 150 km at a depth of 600 km. The amount of smearing increases significantly with depth. The angle of the smearing indicates that the apparent dip we observe in the model cannot be well-constrained.

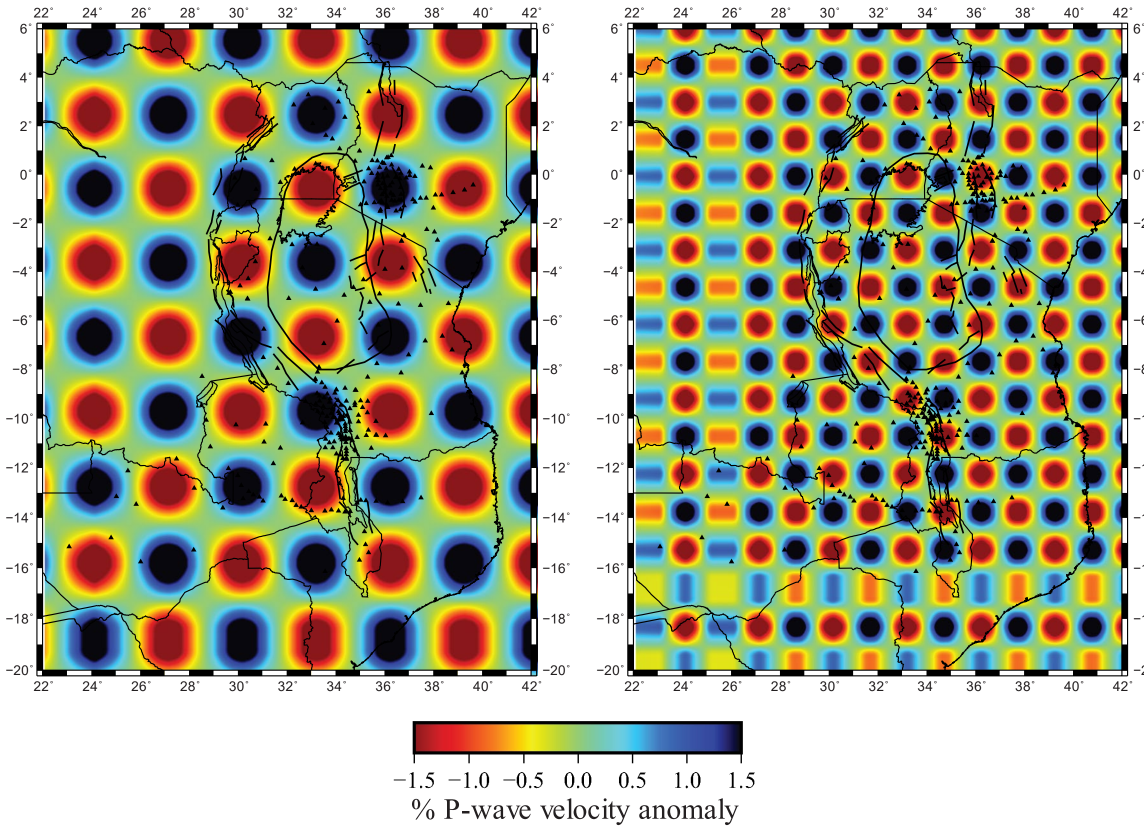

Figure **3-7**: Input synthetic model for checkerboard tests using: (left) 200 km diameter spheres (right) 100 km diameter spheres. The checkers are centered at every 100 km depth from depths of 100 km to 600 km. The checkers at the edge of the 100 km sphere model are stretched in areas where the spheres are smaller than the knot size in the model parameterization. These checkers are at the edge of the model where resolution is limited. The checkerboard is plotted on the P-wave scale here for reference, but the input checkers are the same for both the P- and S-wave model. Geology is from *Mulibo and Nyblade* [2013]. Triangles are stations used in the model.

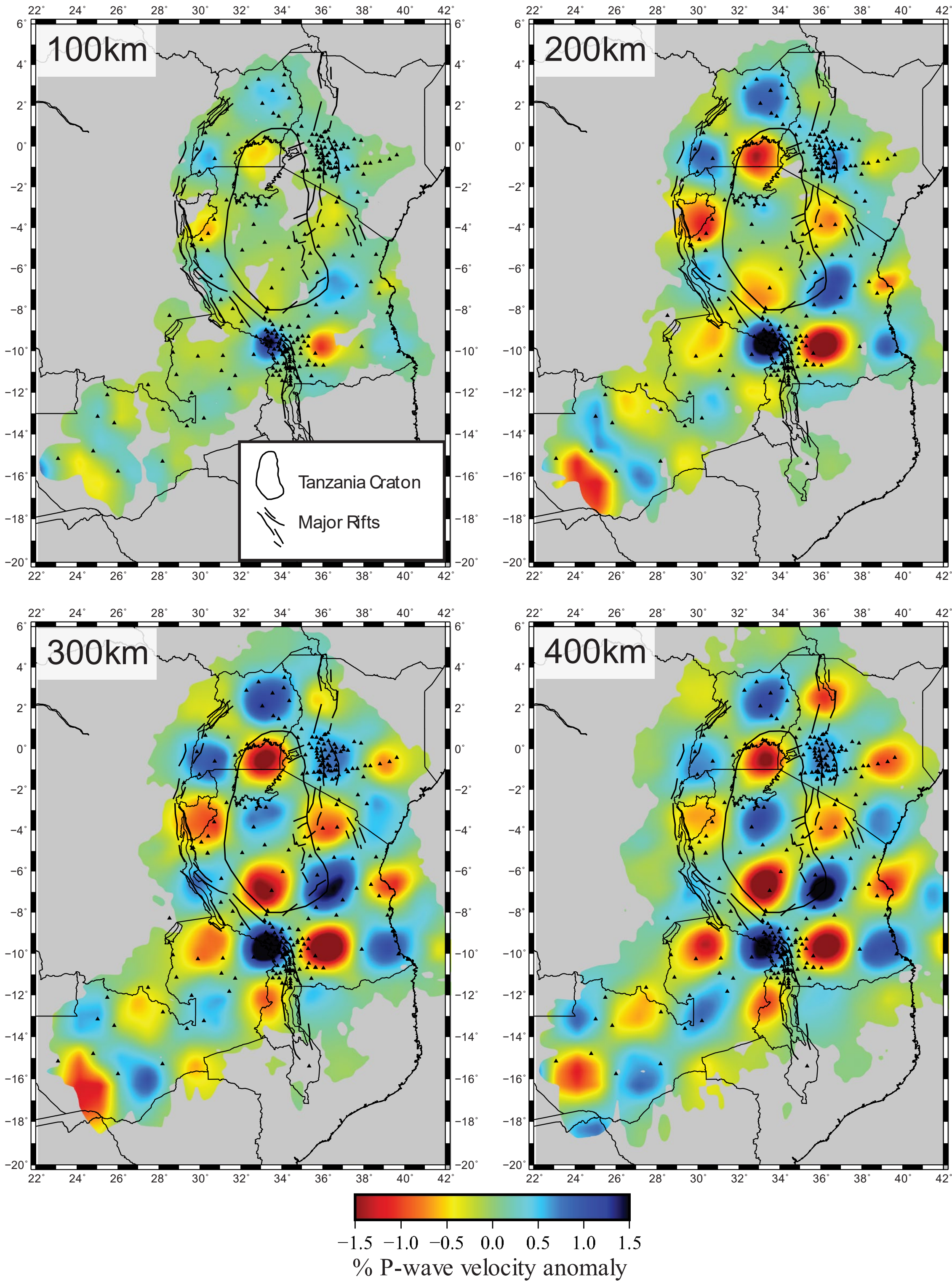

Figure **3-8**: Depth sections of the 200 km wide P-wave checkerboard test results at 100, 200, 300, and 400 km depths. Geology from *Mulibo and Nyblade* [2013]. Triangles are stations used in the model.

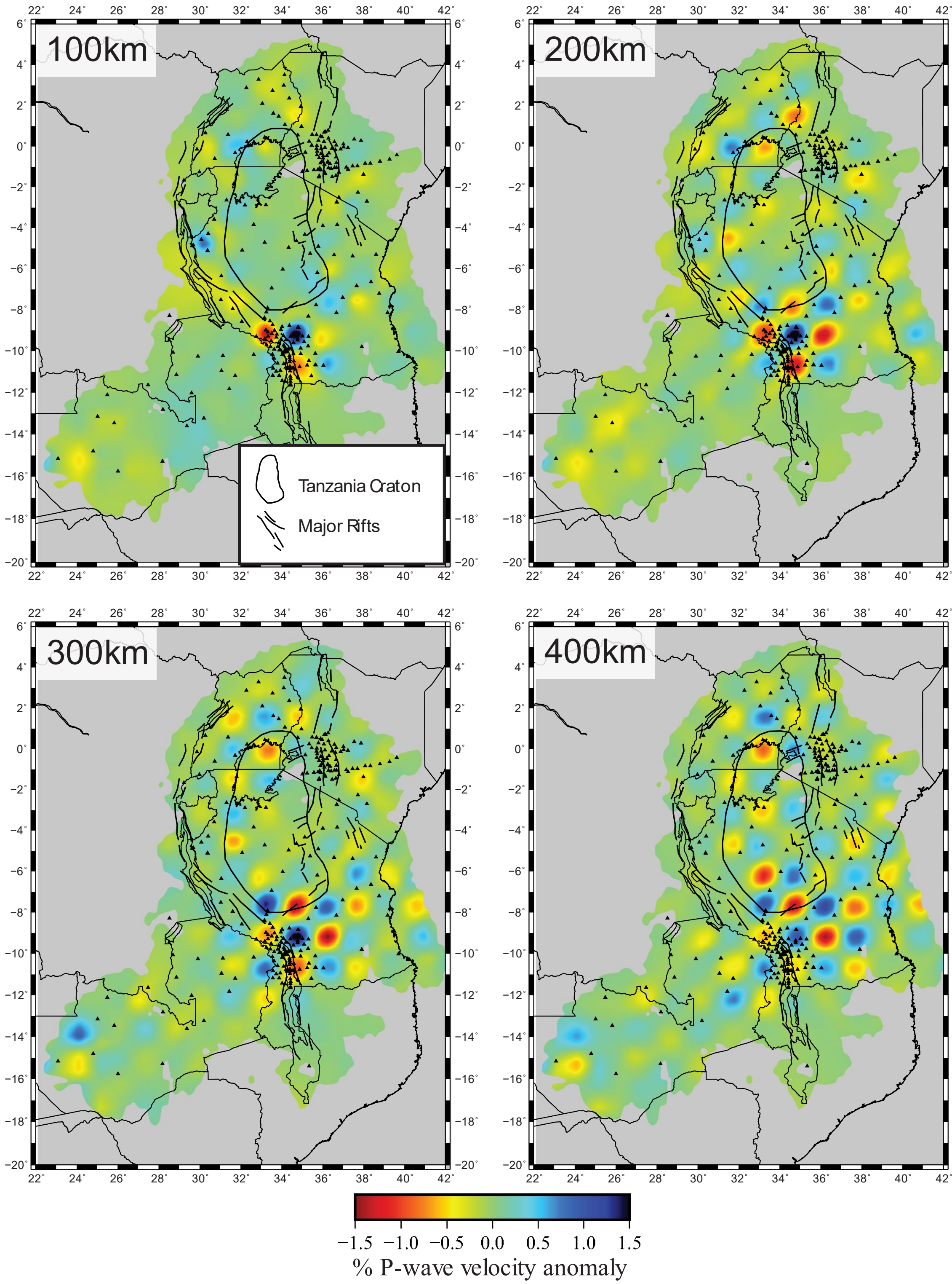

Figure **3-9:** Depth sections of the 200 km wide P-wave checkerboard test results at 100, 200, 300, and 400 km depths. Geology from *Mulibo and Nyblade* [2013]. Triangles are stations used in the model.

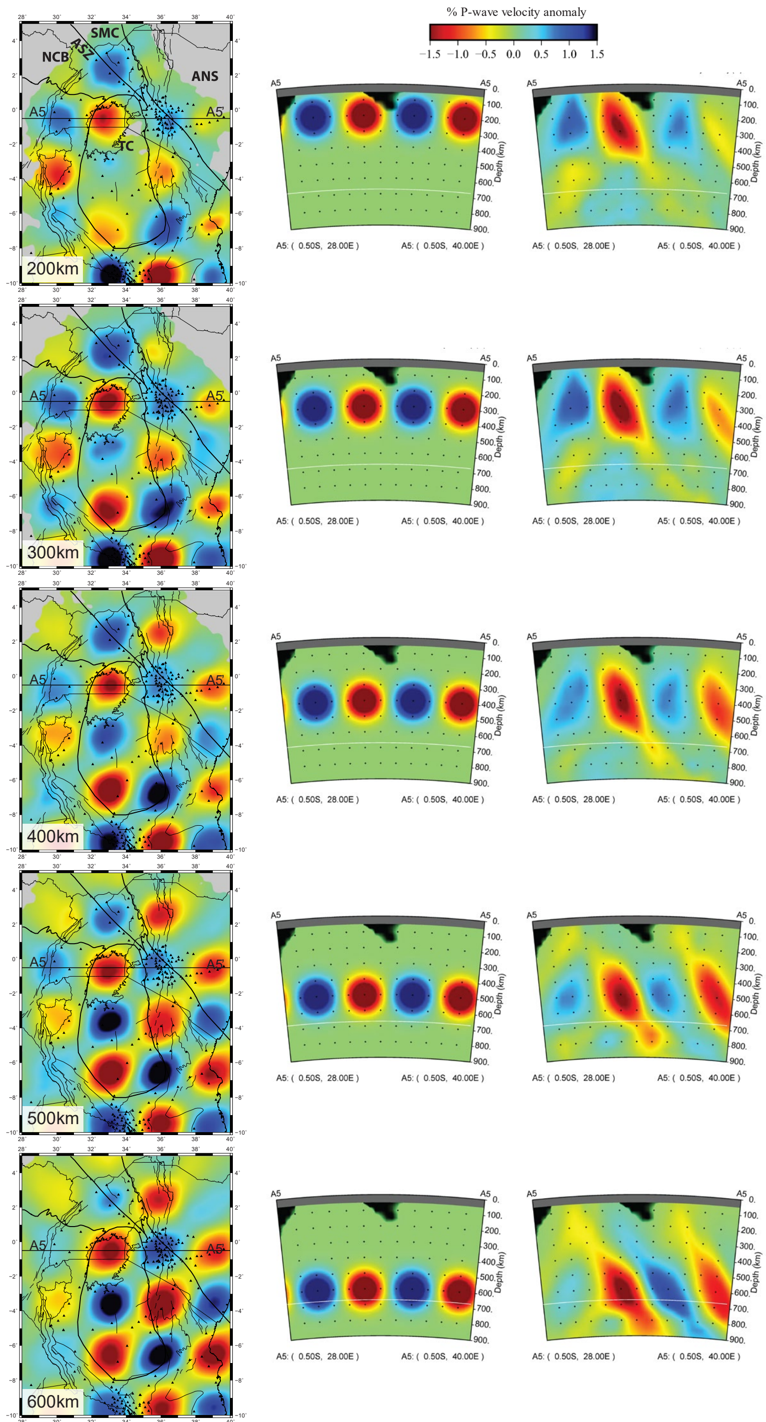

Figure **3-10**: Comparison of P-wave checkerboard resolution results in map view (left), the input model in cross section view (middle) and the output in cross section view (right) at depth intervals of 100 km from depths of 100 km to 600 km. Geology from *Katumwehe et al.* [2016] and *Mulibo and Nyblade* [2013]. Triangles are stations used in the model. NCB – North Congo Block, SMC – Saharan Metacraton, ANS – Arabian-Nubian Shield, TC – Tanzania Craton, ASZ – Aswa Shear Zone.

3.3: S-model Body-wave Tomography Results

3.3.1: Model Results

Though the magnitude of the anomalies are larger for S-wave tomography models, the first order structures are largely the same as in the P-wave model. The S-wave model extends the previous tomography models [*Grijalva et al.*, 2018; *Mulibo and Nyblade*, 2013] north into Uganda. The same prominent low wave-speed anomaly (Anomaly B) is imaged in northeastern Uganda with a δVs = ~-1.0 – -2.0% (Figures 3-11, 3-12, Appendix B-4). The LWA is broader in the S-wave model at approximately 120 km wide (E-W) by at least 200 km long (N-S) (Figures 3-11, 3-12, Appendix B-4). One notable difference from the P-wave model is a more apparent connection between Anomaly B and the deeper LWA to the south. The maximum depth is therefore either 500 km if the anomalies are two discrete structures or 900 km for a single structure (Figure 3-12, Appendix B-4). Anomaly B in the S-wave model (Figure 3-12, Profile A2) has a similar structure and apparent dip to the structure in the P-wave model (~60°), however, further south (Figure 3-12, Profiles A3-A5) appears to merge with the LWA positioned below the fast wave-speed anomaly (FWA) interpreted as the Tanzania Craton [*Grijalva et al.*, 2018; *Mulibo and Nyblade*, 2013; *Park and Nyblade*, 2006]. The FWA (Anomaly A) in central Uganda is similarly imaged with a δVs = 1.0 – 2.0% but is less clearly connected to the FWA previously imaged to the south of beneath the Tanzania Craton (Figures 3-11, 3-12, Appnedix B-4) [*Grijalva et al.*, 2018; *Mulibo and Nyblade*, 2013; *Park and Nyblade*, 2006].

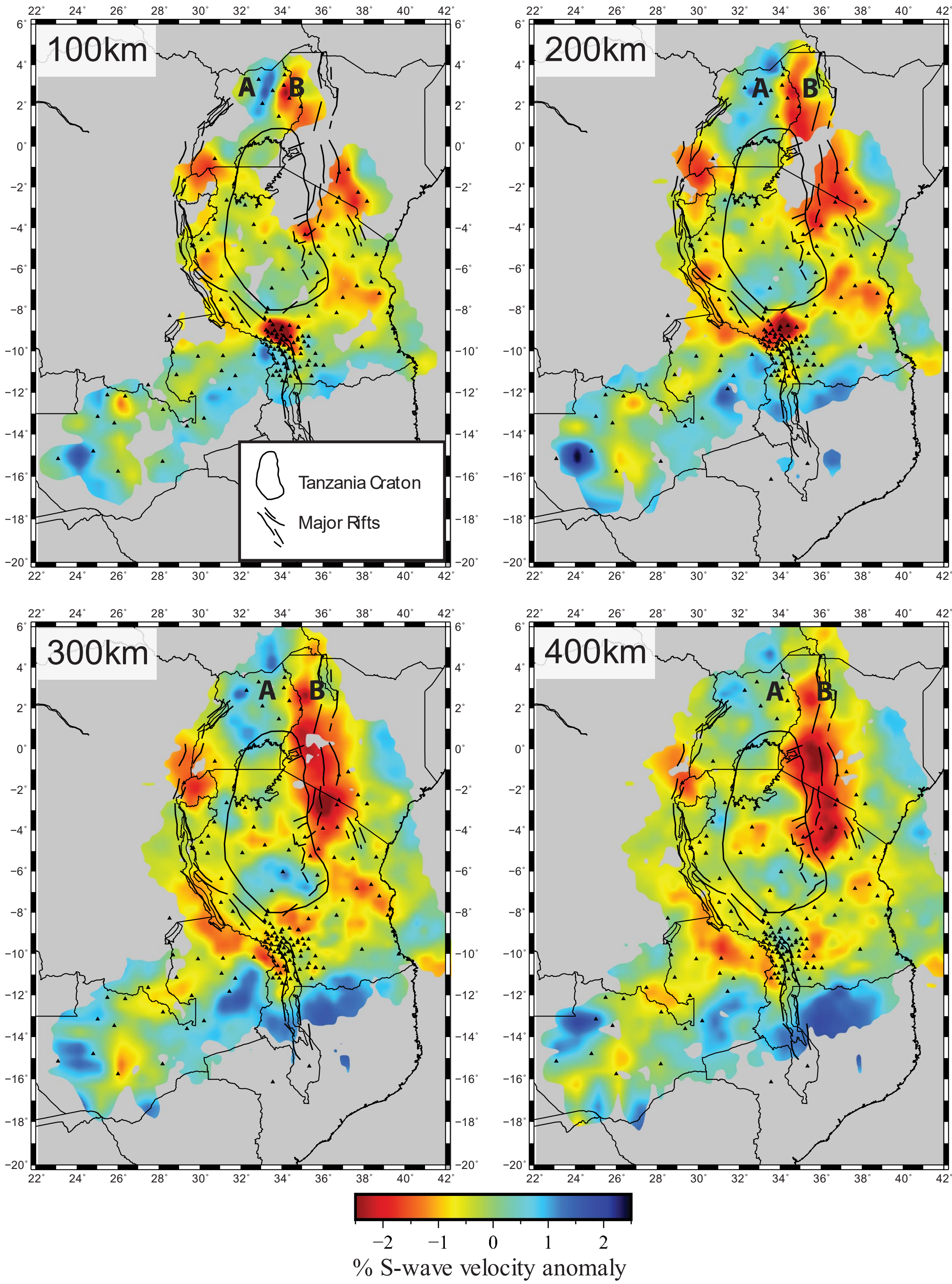

Figure **3-11**: Horizontal sections through the S-wave tomography model at 100 km to 400 km depths. Geological features are from *Mulibo and Nyblade* [2013]. Triangles are stations used in the model.

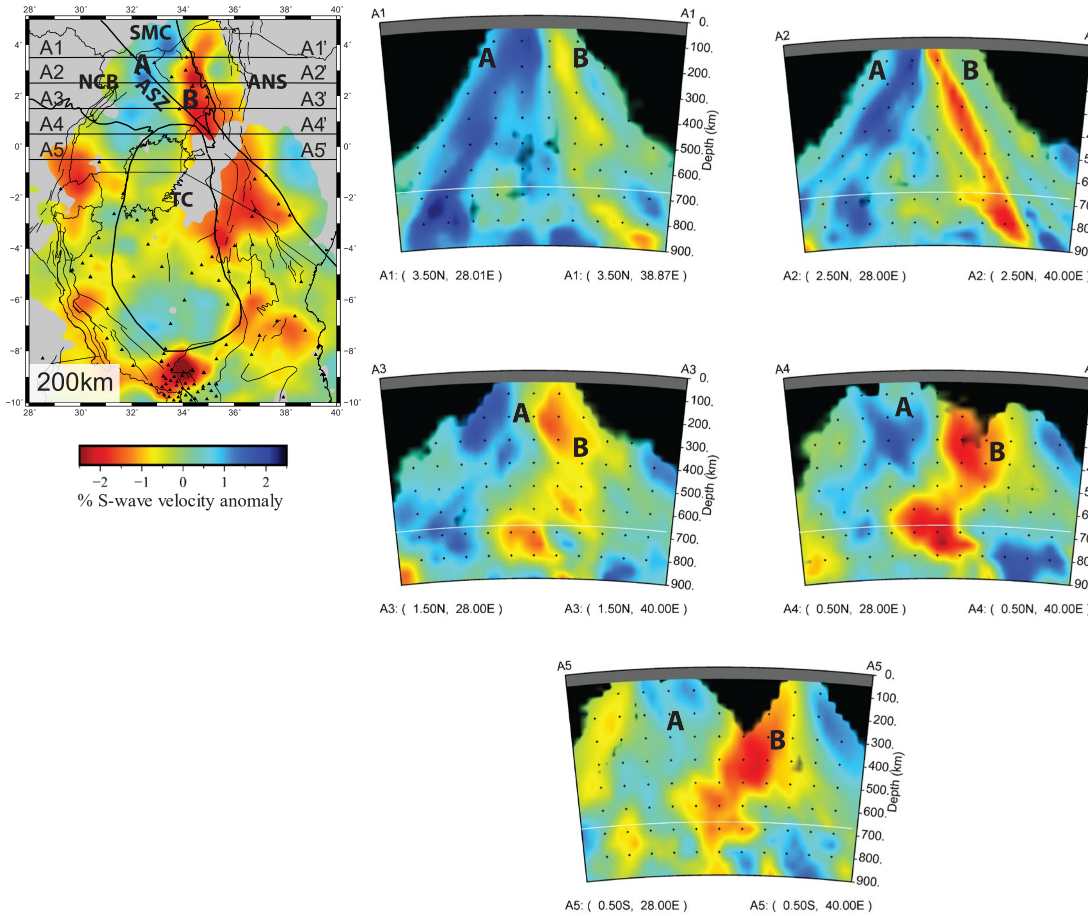

Figure **3-12**: Vertical sections from the S-wave tomography model through. Index map at 200 km depth shows the location of the depth slices. The slices show the new low-wave speed anomaly (LWA, "B") from A-1 through A-3. A-4 and A-5 show major LWA structures previously described in *Mulibo and Nyblade* [2013]. A fast wave-speed anomaly (FWA, "A") is apparent in the center of the cross sections A1 – A5 in central Uganda. Geology shown in left panel is from *Katumwehe et al.* [2016] and *Mulibo and Nyblade* [2013]. Triangles are stations used in the model. NCB – North Congo Block, SMC – Saharan Metacraton, ANS – Arabian-Nubian Shield, TC – Tanzania Craton, ASZ – Aswa Shear Zone.

3.2.2: Resolution Tests

A checkerboard model was also used to investigate the resolution of the S-wave model. Raypaths and regularization parameters from the S-wave model were used, and a standard deviation of 0.1 s was used to add Gaussian noise to the model (Figures 3-13, 3-14, Appendices B-5 and B-6).

The 200 km diameter checkerboard model is well resolved at depths greater than 100 km for most of the model, though not as well as the P-wave model (Figures 3-13, Appendix B-5). The S-wave checkerboard model with 200 km checkers shows vertical smearing for some of the spheres throughout the model. The 100 km diameter checkerboards are not well recovered in the model except for the area surrounding Rungwe Volcanic Province in the south (Figures 3-14, Appendix B-6). Given that the S-wave model has less than half the number of raypaths as the P-wave model (see Chapter 2) and has more horizontal smearing, it is not surprising that the model doesn't show the same degree of resolution for the 100 km diameter checkers as does the P-wave model. The results indicate that in the horizontal direction, Anomaly B is well resolved to a width of approximately 200 km. The width of Anomaly B is larger in the S-wave model than in the P-wave model by about 40 km in the east-west direction and 100 km or more in the north-south direction (Figure 3-5, 3-11, Appendices B-1 and B-4). The resolution tests indicate that this increased size is likely due to horizontal smearing.

Like the P-wave model, the vertical resolution of the S-wave model is more limited. Figure 3-15 shows the checkerboard model output in map view alongside cross sections for the input and output for the A5-A5' profile at depths of 200 km to 600 km. The amount of smearing ranges from approximately 200 km at a depth of 200 km to approximately 300 km at the depth of 600 km. Smearing increases significantly with depth. The amount of vertical smearing in the S-wave model is approximately double the vertical smearing of the P-wave model.

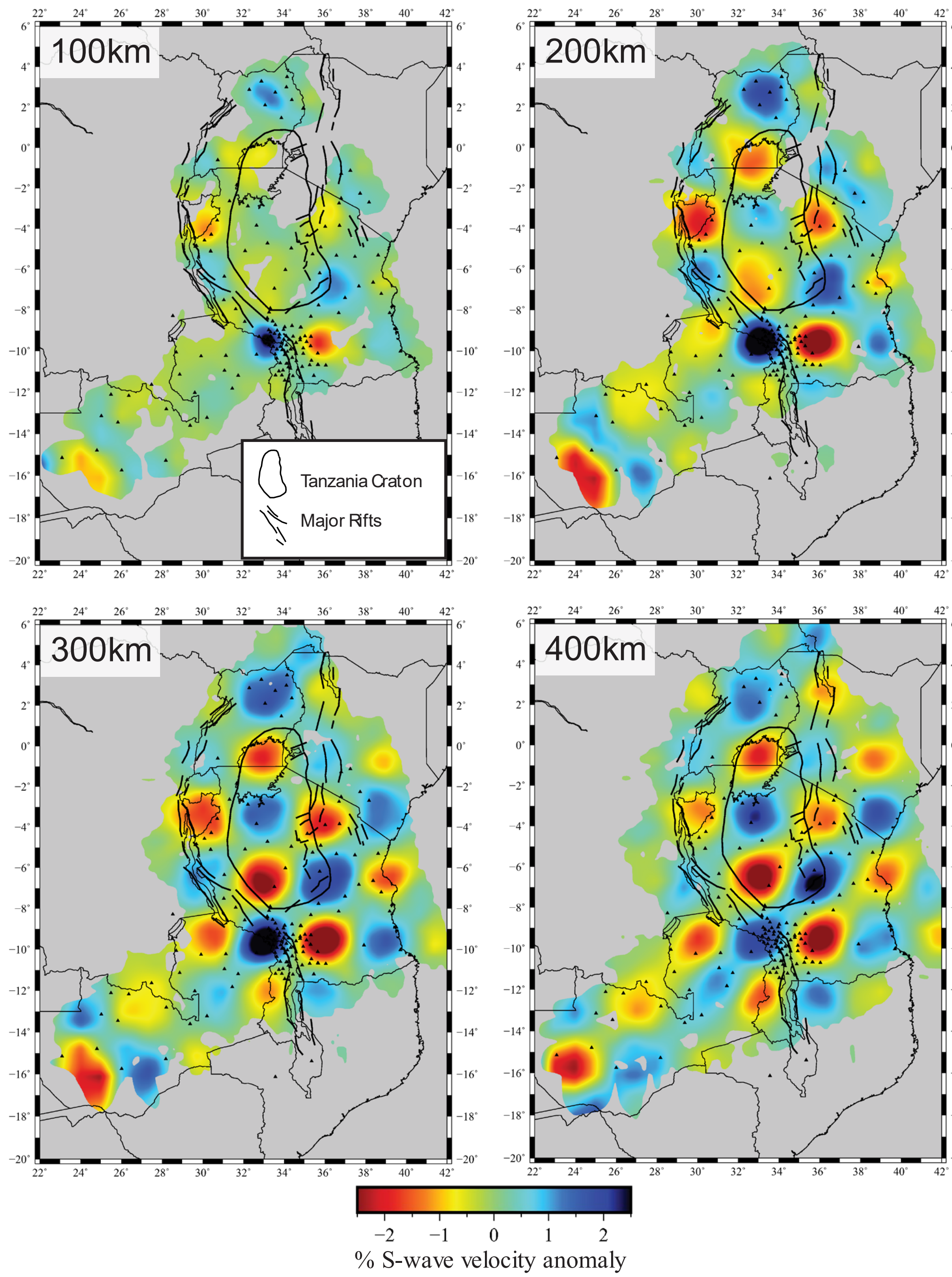

Figure **3-13**: Depth sections of the 200 km wide S-wave checkerboard test results at 100, 200, 300, and 400 km depths. Geology from *Mulibo and Nyblade* [2013]. Triangles are stations used in the model.

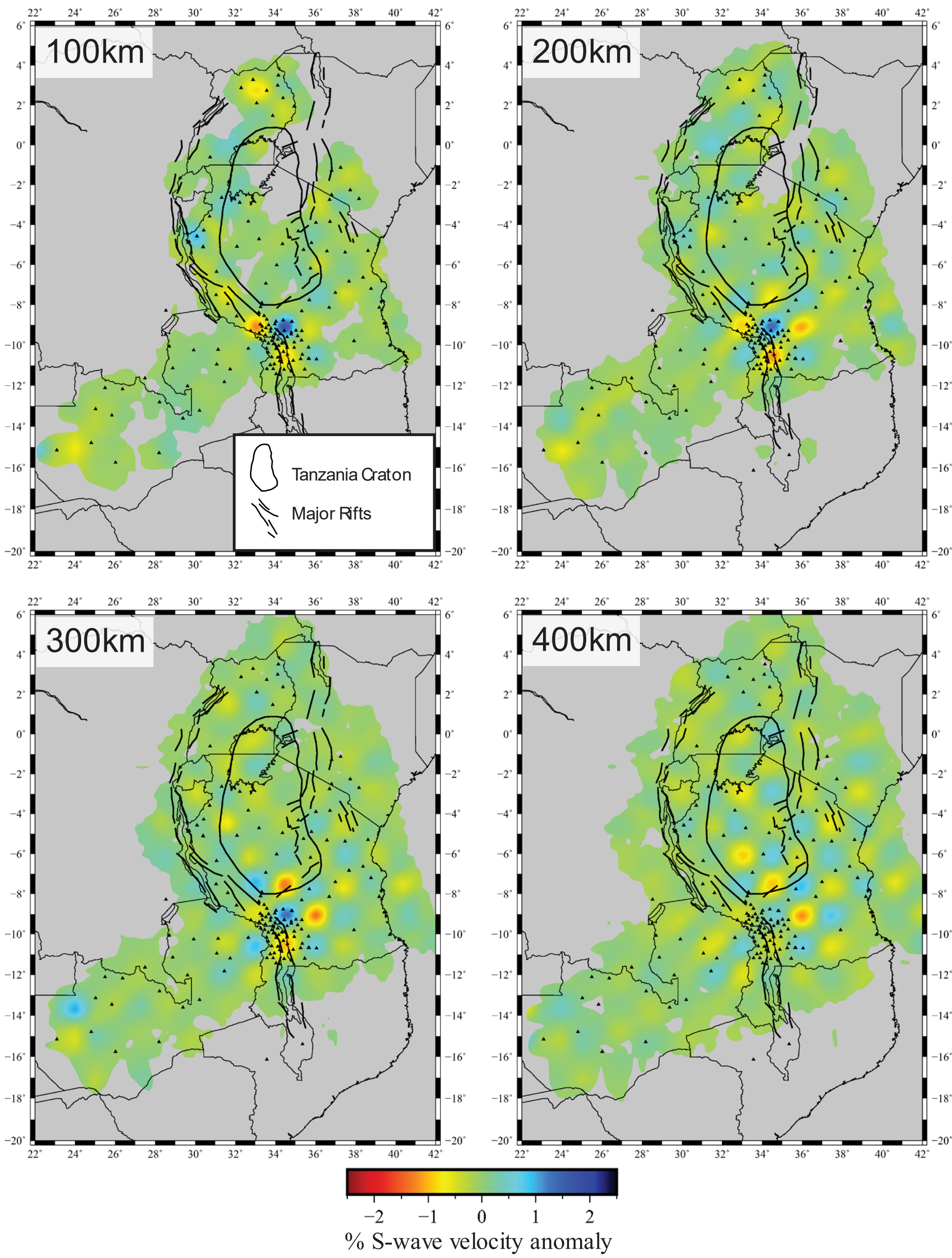

Figure **3-14**: Depth sections of the 100 km wide S-wave checkerboard test results at 100, 200, 300, and 400 km depths. Geology from *Mulibo and Nyblade* [2013]. Triangles are stations used in the model.

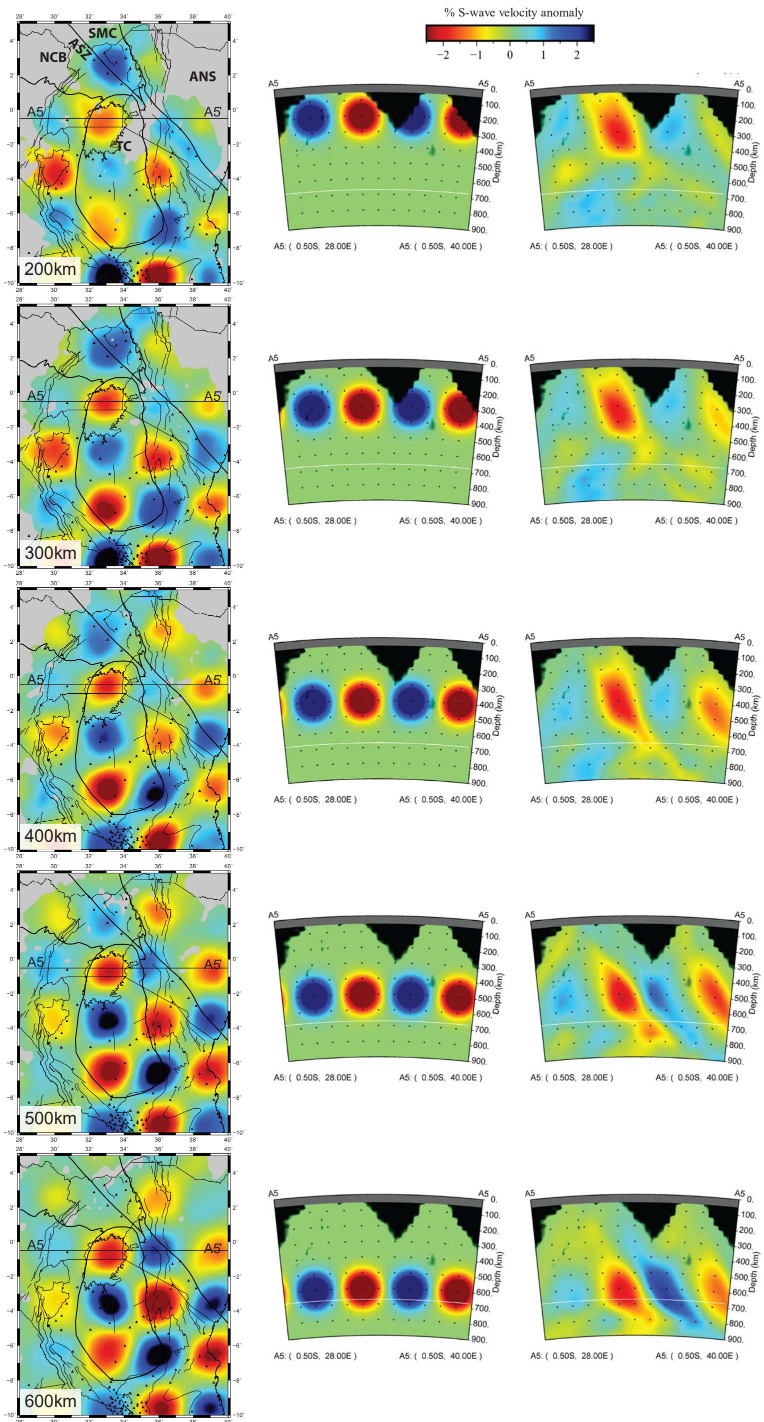

Figure **3-15**: Comparison of S-wave checkerboard resolution results in map view (left), the input in cross section view (middle) and the output in cross section view (right) at depth intervals of 100 km from 100 km – 600 km. Geology from *Katumwehe et al.* [2016] and *Mulibo and Nyblade* [2013]. Triangles are stations used in the model. NCB – North Congo Block, SMC – Saharan Metacraton, ANS – Arabian-Nubian Shield, TC – Tanzania Craton, ASZ – Aswa Shear Zone.

Chapter 4

Discussion

4.1: Summary of Results

The P- and S-wave models in this study are similar to previous studies [*Adams et al.*, 2012; *Emry et al.*, 2019; *Grijalva et al.*, 2018; *Mulibo and Nyblade*, 2013; *Park and Nyblade*, 2006] except in the study area. The new models show two main features. Anomaly A is a FWA in northern Uganda at depths of 100 km to 300 km, with δV_p = ~+0.5% - +1.2% and δV_s = ~+1% - 2% (Figures 4-1 - 4-3). Fast wave speed anomalies in the upper mantle have often associated with cratonic mantle [*Emry et al.*, 2019; *Mulibo and Nyblade*, 2013; *O'Donnell et al.*, 2013; *Park and Nyblade*, 2006; *Ritsema et al.*, 1998]. Cratons, such as those in the East African Rift System, are underlain by thick and cold mantle roots [*Lee*, 2006]. Harzburgite xenoliths in cratonic mantle are depleted of FeO, Al_2O_s, and CaO, resulting in a decreased density. The origin of formation of the cold cratonic mantle is proposed as the removal of the basaltic component of the mantle in ridge-like settings during a period of higher ambient mantle temperatures and melting in the Archean [*Herzberg and Rudnick*, 2012]. The relationship between temperature and seismic velocities from *Goes et al.* [2000] shows that every 0.5% to 2% increase in P-wave velocity results in a 100 K decrease in temperature at depths of 50 km to 250 km. For S-waves, a 0.7% to 4.5% increase in velocity would indicate a 100 K decrease in temperature. The P-wave and S-wave models show δV_p = ~+0.50- +1.20% and δV_s = ~+1.00% - +2.00% for Anomaly A. Checkerboard resolution tests indicate 20% recovery for the P-wave model and 15% recovery for the S-wave model. The scaled velocity anomalies are therefore δV_p = ~+2.50- +6.00% and δV_s = ~+6.67% - +13.33%. Since *Goes et al.* [2000] attributes a maximum of 1% to compositional variation, we determine temperatures anomalies of -75 – -1,400 K (P-wave) and -130 – -2,050 K (S-wave) for Anomaly A. These temperatures form a lower bound of -75– -130 K.

Anomaly A was not well imaged in previous body wave models of eastern Africa. However, this feature does show up at shallow depths in the full-wave ambient noise tomography from *Emry et al.* [2019] to depths of at least 260 km, as well as the *Adams et al.* [2012] surface wave model. This anomaly suggests that the Ugandan Basement Complex or Ugandan Terrane extends further north than previously recognized. Additionally, Anomaly A extends north of the surface expression of the ASZ. As discussed in section 1.3.2 there are two interpretations of FWA extending across the ASZ. The first, proposed by *Adams et al.* [2012], interprets the FWA as a northward extension of thick lithosphere under the Tanzania Craton. *Emry et al.* [2019], however, propose that the FWA north of the ASZ is a southeastern extension of thick lithosphere belonging to the Congo Craton. Our model results do not allow us to favor one which interpretation over the other. However, the extension of Feature A into northern Uganda indicates that at depth, the ASZ does not make a change the upper mantle structure beneath northern Uganda.

Anomaly B is a LWA in northeastern Uganda to the east of the ASZ. The LWA extends from depths of 100 km to 400 km, though some vertical smearing is occurring. The LWA has a δV_p = ~-0.5- -1.25% and δV_s = ~-1.0% - -2.25% (Figures 4-1 – 4.3). Low wave speeds in the mantle may be due to temperature, water, partial melt, or compositional variations [*Sobolev et al.*, 1996]. The lack of subduction in eastern Africa since 500 Ma or earlier [*Kröner*, 1981] rules out water as a cause for Anomaly B. According to *Sobolev et al.* [1996], compositional variation only significantly impacts upper mantle velocities when there are depleted Mg-rich harzburgites present, however, harzburgites are typically found in cratons, so it is unlikely that composition plays a role in the anomaly. The relationship between temperature and seismic velocities from *Goes et al.* [2000] shows that every 0.5% to 2% decrease in P-wave velocity results in a 100 K increase in temperature at depths of 50 km to 250 km. For S-waves, a 0.7% to 4.5% decrease in velocity would indicate a 100 K increase in temperature. The P-wave and S-wave models show δV_p = ~-0.50- -1.25% and δV_s = ~-1.00% - -2.25% for Anomaly B. Checkerboard resolution tests indicate 20% recovery for the P-wave model and 15% recovery for the S-wave model. The scaled velocity anomalies are therefore δV_p = ~-2.50- -6.25% and δV_s = ~-6.67% - -15.00%. Since *Goes et al.* [2000] attributes a maximum of 1% to compositional variation, we determine temperatures anomalies of 75 – 1,500 K (P-wave) and 130 – 2,000 K (S-wave) for Anomaly B. These temperatures form a lower bound of 75-130 K, which is consistent with the 100 K – 200 K for the EARS estimated by *O'Donnell et al.* [2013]. The higher bounds would indicate melting of the mantle. However, there are no volcanics in the area of Anomaly B, so temperature high enough to melt the mantle lithosphere are not likely.

Anomaly B appears to be connected to the LWA beneath the Kenya Rift imaged in previous studies (Figures 4-1 – 4.4) [*Grijalva et al.*, 2018; *Mulibo and Nyblade*, 2013; *Park and Nyblade*, 2006]. This finding indicates that the Kenya Rift broadens to the north, extending beneath the northern part of the East African Plateau all the way to the ASZ in the west, and to the eastern side of the Turkana Depression in the east. The presence of thermally perturbed upper mantle related to the rift beneath the northeastern corner of the East African Plateau well to the west of the rift faulting that defines the location of the Kenya Rift, has not been previously imaged.

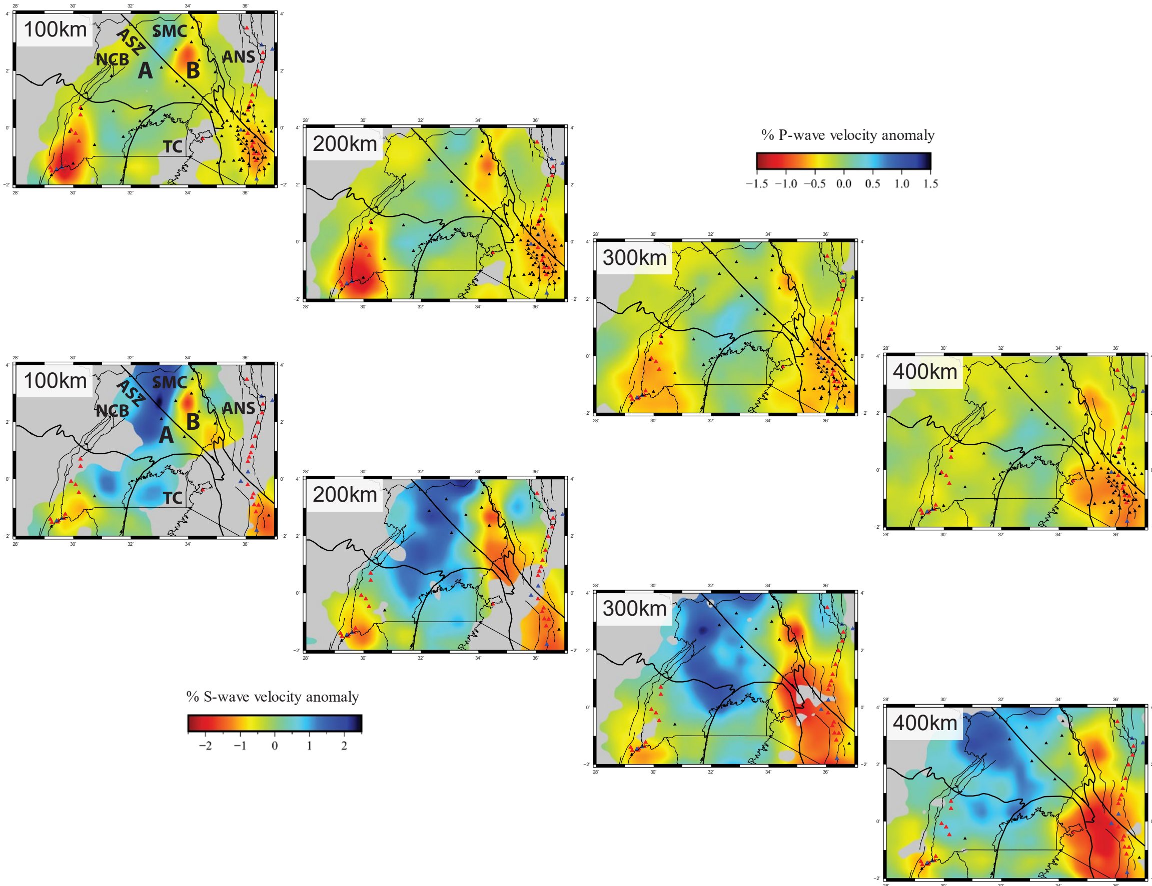

Figure **4-1**: P-wave and S-wave model depth sections at 100, 200, 300, and 400 km depths in the study area. Rifts and major geological boundaries are from *Katumwehe et al.* [2016] and Tanzania Craton boundary is from *Mulibo and Nyblade* [2013]. Black triangles are stations used in the model. Red triangles are volcanoes active in the Holocene and blue triangles are volcanoes active in the Pleistocene [*Global Volcanism Program*, 2013]. NCB – North Congo Block, SMC – Saharan Metacraton, ANS – Arabian-Nubian Shield, TC – Tanzania Craton, ASZ – Aswa Shear Zone.

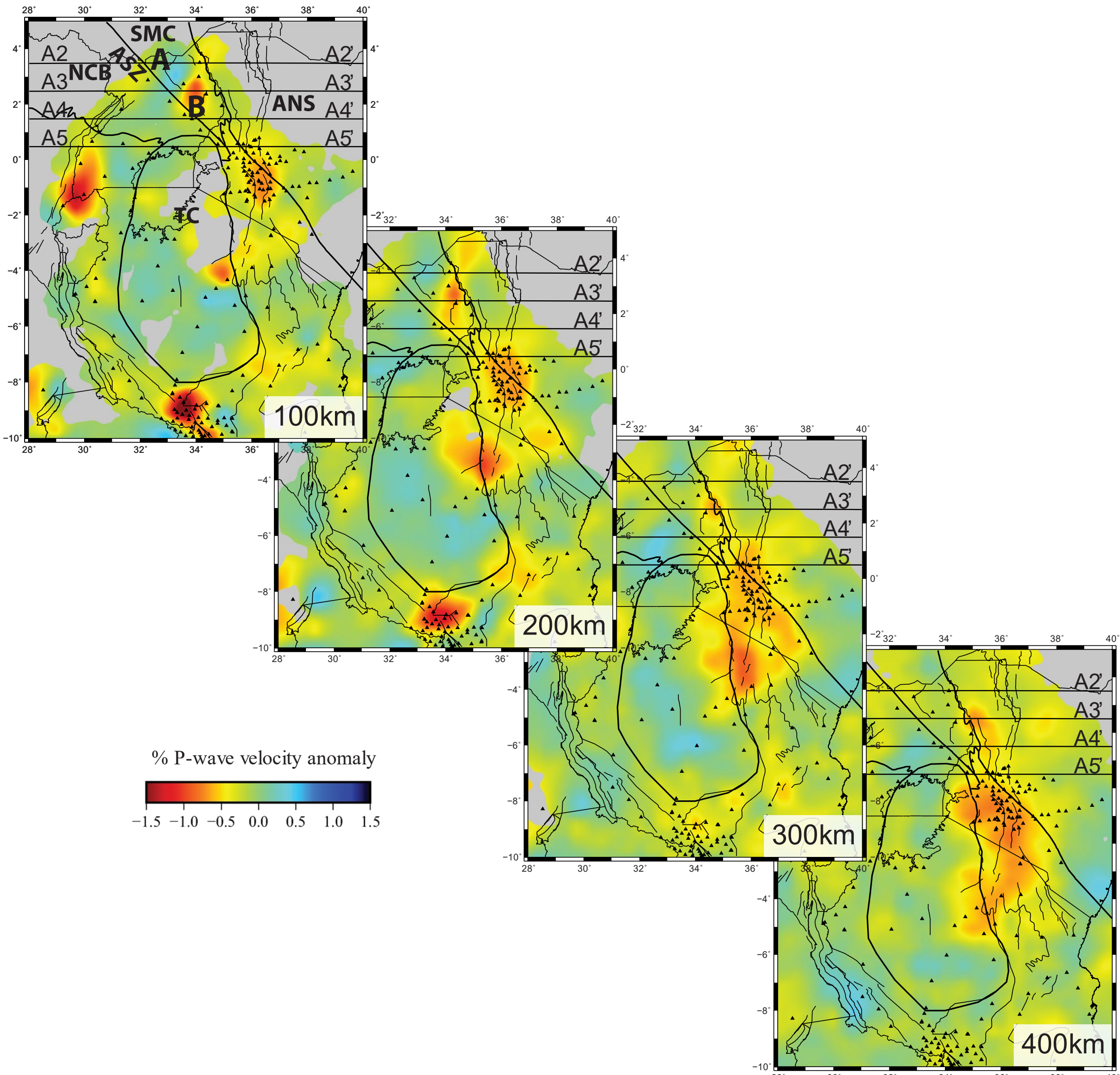

Figure **4-2**: P-wave model depth sections at 100, 200, 300, and 400 km depths. Rifts and major geological boundaries are from *Katumwehe et al.* [2016] and Tanzania Craton boundary is from *Mulibo and Nyblade* [2013]. Triangles are stations used in the model. NCB – North Congo Block, SMC – Saharan Metacraton, ANS – Arabian-Nubian Shield, TC – Tanzania Craton, ASZ – Aswa Shear Zone.

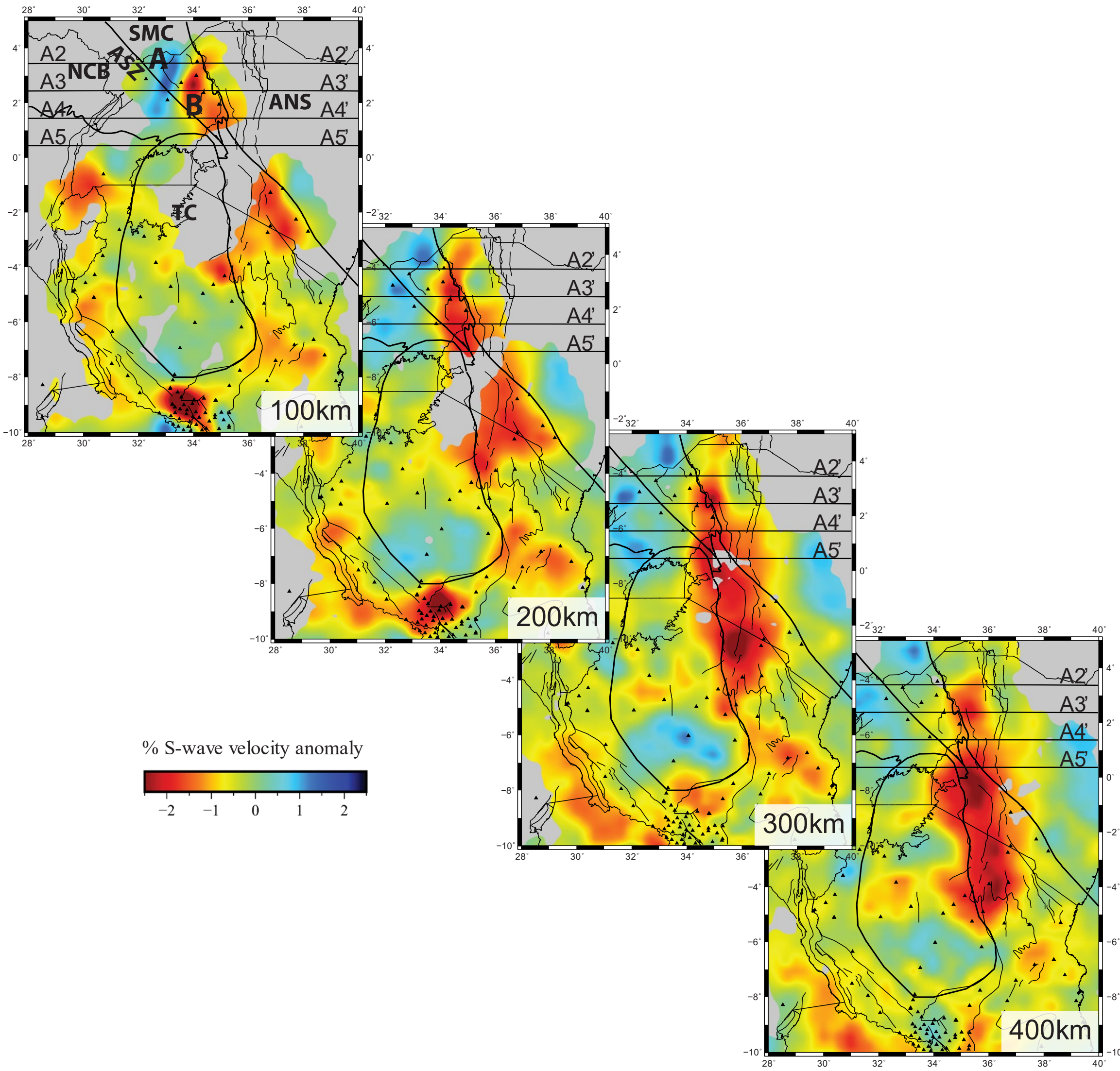

Figure **4-3**: S-wave model depth sections at 100, 200, 300, and 400 km depths. Rifts and major geological boundaries are from *Katumwehe et al.* [2016] and Tanzania Craton boundary is from *Mulibo and Nyblade* [2013]. Triangles are stations used in the model. NCB – North Congo Block, SMC – Saharan Metacraton, ANS – Arabian-Nubian Shield, TC – Tanzania Craton, ASZ – Aswa Shear Zone.

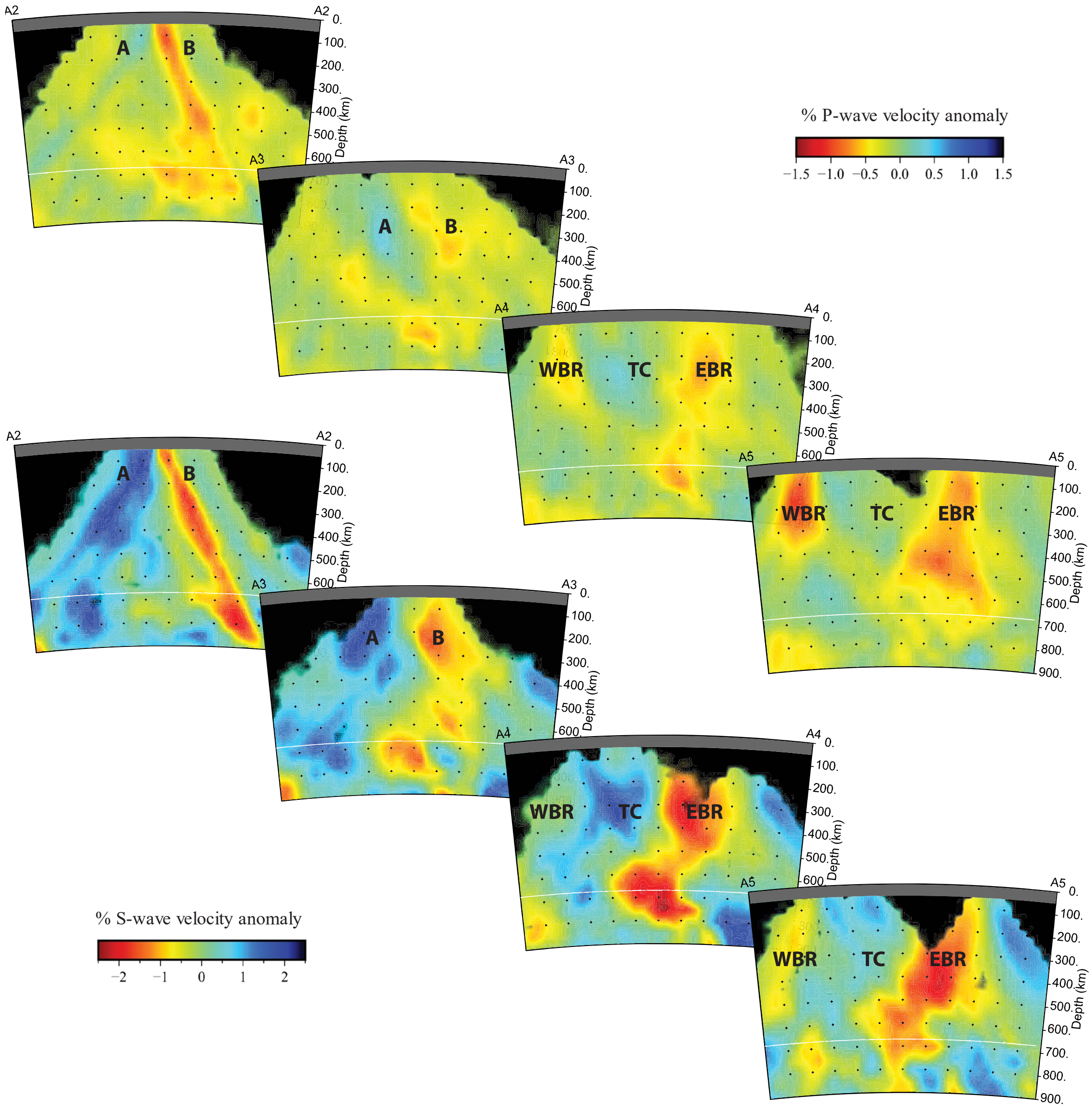

Figure **4-4**: Vertical sections A2 to A5 from the P-wave (top) and S-wave (bottom) body-wave tomography model. Location of the sections are shown in Figure 4-1 and 4-2. A – Anomaly A FWA, B – Anomaly B LWA, WBR – Western Branch, TC – Tanzania Craton, EBR – Eastern Branch.

4.2: Tabular Body Tests

To illustrate that Anomaly B could represent the upwelling of warm mantle along the eastern side of the thick cratonic lithosphere, tabular body tests were used to determine the relationship between Anomaly B and the previously imaged LWA beneath the Kenya Rift [*Adams et al.*, 2012; *Mulibo and Nyblade*, 2013; *O'Donnell et al.*, 2013; *Park and Nyblade*, 2006]. As discussed in *Mulibo and Nyblade* [2013], a possible origin for the upwelling of warm material could be the African Superplume. Alternatively, it could be from a plume localized under the center of the East African Plateau.

Several tabular body input models were used with anomalies in the same orientation of Anomaly B and the LWA from earlier studies, for both the P- and S-wave models (Figures 4-4, 4-5, Appendix B-7 through B-10). Several models were also run with tabular bodies representing either just Anomaly B or just the LWA from the previous studies (Appendix B-7 through B-10).

For modeling Anomaly B, a 345°-trending 150 km wide (E-W) and 444 km long (N-S) slab was placed at depths of 50 km to 250 km in the location of Anomaly B (Figure 4-4). For the input tabular body for the LWA under the Kenya Rift, I used a 0°-trending 150 km wide (E-W) and 150 km (N-S) long slab placed at a depth of 200 km to 600 km in the same location as the LWA imaged in previous studies (Figure 4-4). The tabular bodies were modeled as ellipsoids with a smooth Gaussian falloff using a -0.5% peak velocity anomaly.

The input models were used to generate synthetic travel times using the raypaths from the P- and S-wave tomography models. Gaussian noise was added as a random time error with a standard deviation of 0.04 s. The resulting travel times were inverted using the same smoothing and flattening parameters as the models to produce synthetic P- and S-wave models (Figures 4-5 to 4-7). The P-wave model shows a small amount of horizontal smearing (Figure 4-5) of about 25 km. The S-wave shows more horizontal smearing than the P-wave model (Figure 4-6) of approximately 75 km. Both models show vertical smearing of about 150 km – 200 km. The tabular body wave tests do not conclusively show if two bodies are connected. However, the tabular body tests show that, in order to reproduce the model, two tabular bodies must be within 25 km distance apart. Given the location and depth of these bodies, we interpret Anomaly B as an extension of the LWA under the central and southern part of the Kenya Rift imaged in previous studies.

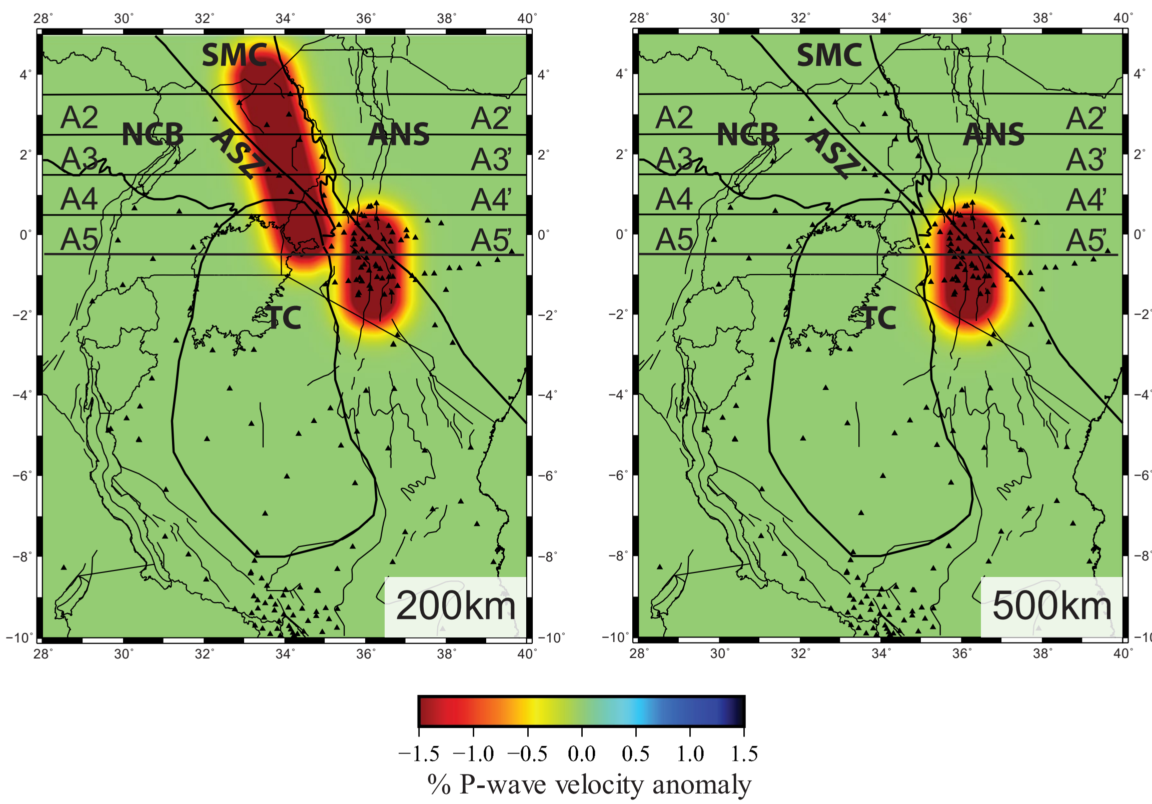

Figure **4-5**: P-wave tabular body input model depth sections at depths of 200 km and 500 km illustrating the two tabular bodies used in the test. The P-wave model is shown, but the S-wave model uses the same input structure. The locations of vertical sections A2 to A5 are shown. Rifts and major geological boundaries are from *Katumwehe et al.* [2016] and Tanzania Craton boundary is from *Mulibo and Nyblade* [2013]. Triangles are stations used in the model. NCB – North Congo Block, SMC – Saharan Metacraton, ANS – Arabian-Nubian Shield, TC – Tanzania Craton, ASZ – Aswa Shear Zone.

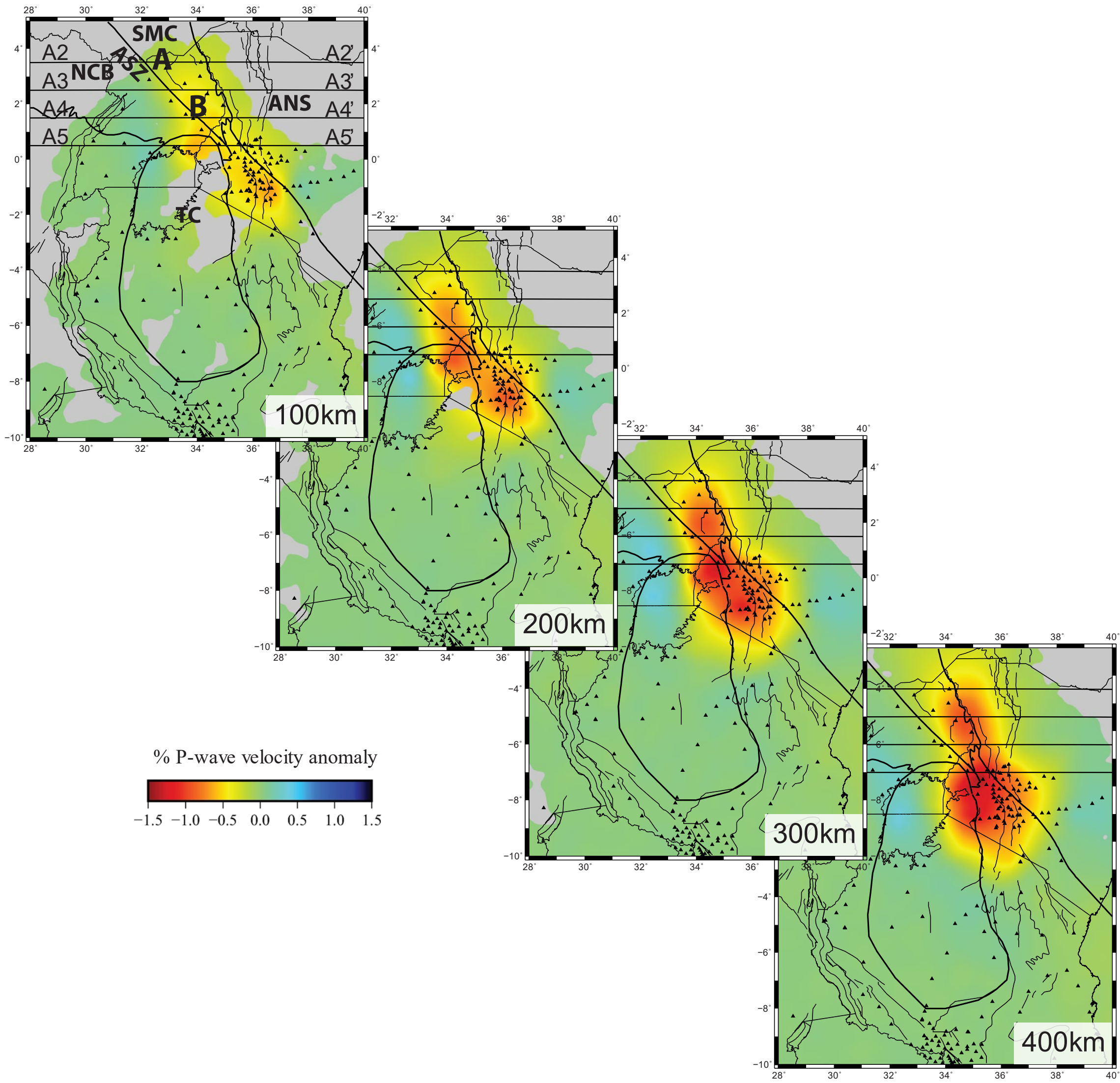

Figure **4-6**: P-wave tabular body depth model sections at depths of 100, 200, 300, and 400 km. The position of vertical sections A2 to A5 are shown. Rifts and major geological boundaries are from *Katumwehe et al.* [2016] and Tanzania Craton boundary is from *Mulibo and Nyblade* [2013]. Triangles are stations used in the model. NCB – North Congo Block, SMC – Saharan Metacraton, ANS – Arabian-Nubian Shield, TC – Tanzania Craton, ASZ – Aswa Shear Zone.

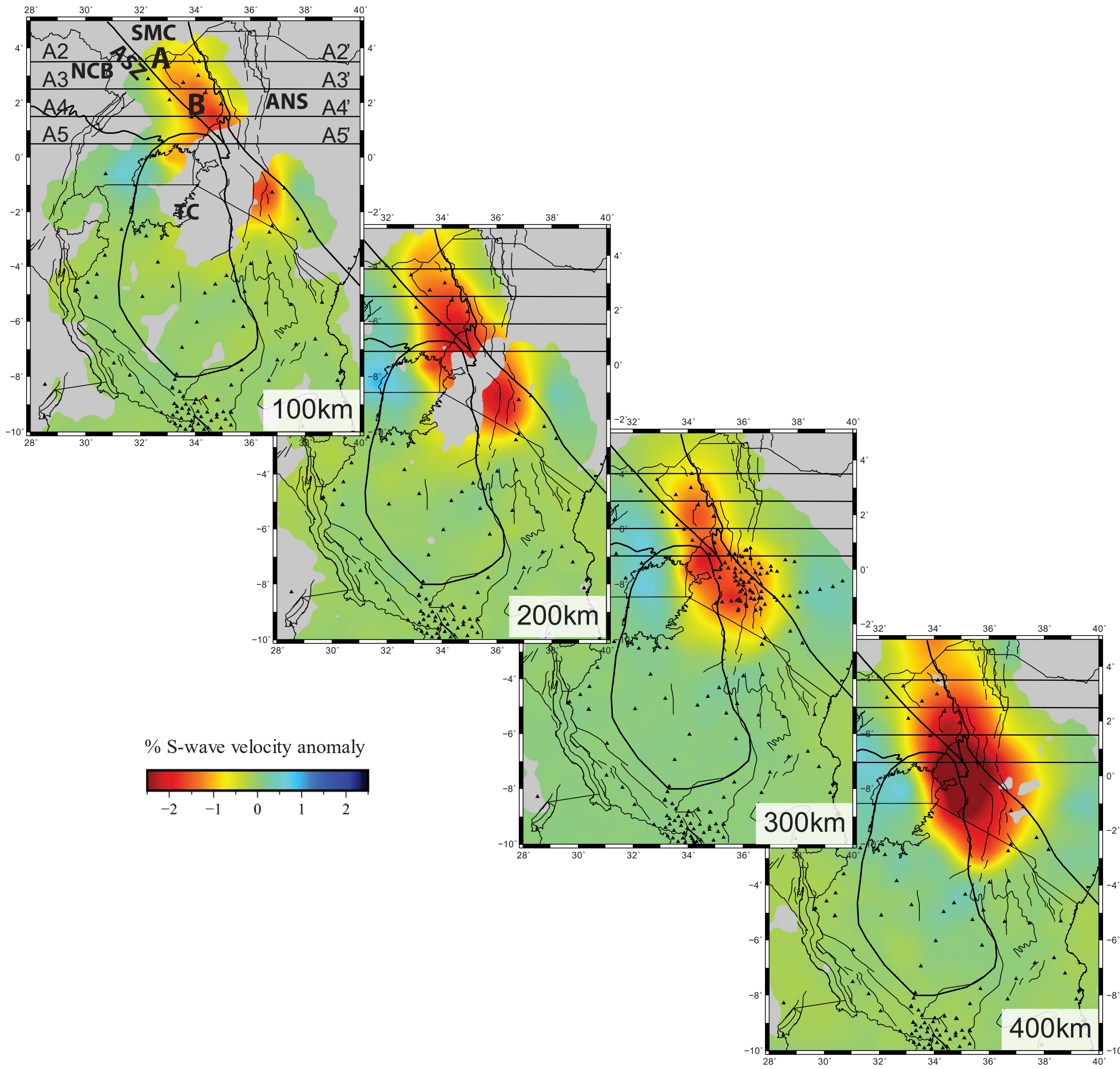

Figure **4-7**: S-wave tabular body depth model sections at depths of 100, 200, 300, and 400 km. The position of vertical sections A2 to A5 are shown. Rifts and major geological boundaries are from *Katumwehe et al.* [2016] and Tanzania Craton boundary is from *Mulibo and Nyblade* [2013]. Triangles are stations used in the model. NCB – North Congo Block, SMC – Saharan Metacraton, ANS – Arabian-Nubian Shield, TC – Tanzania Craton, ASZ – Aswa Shear Zone.

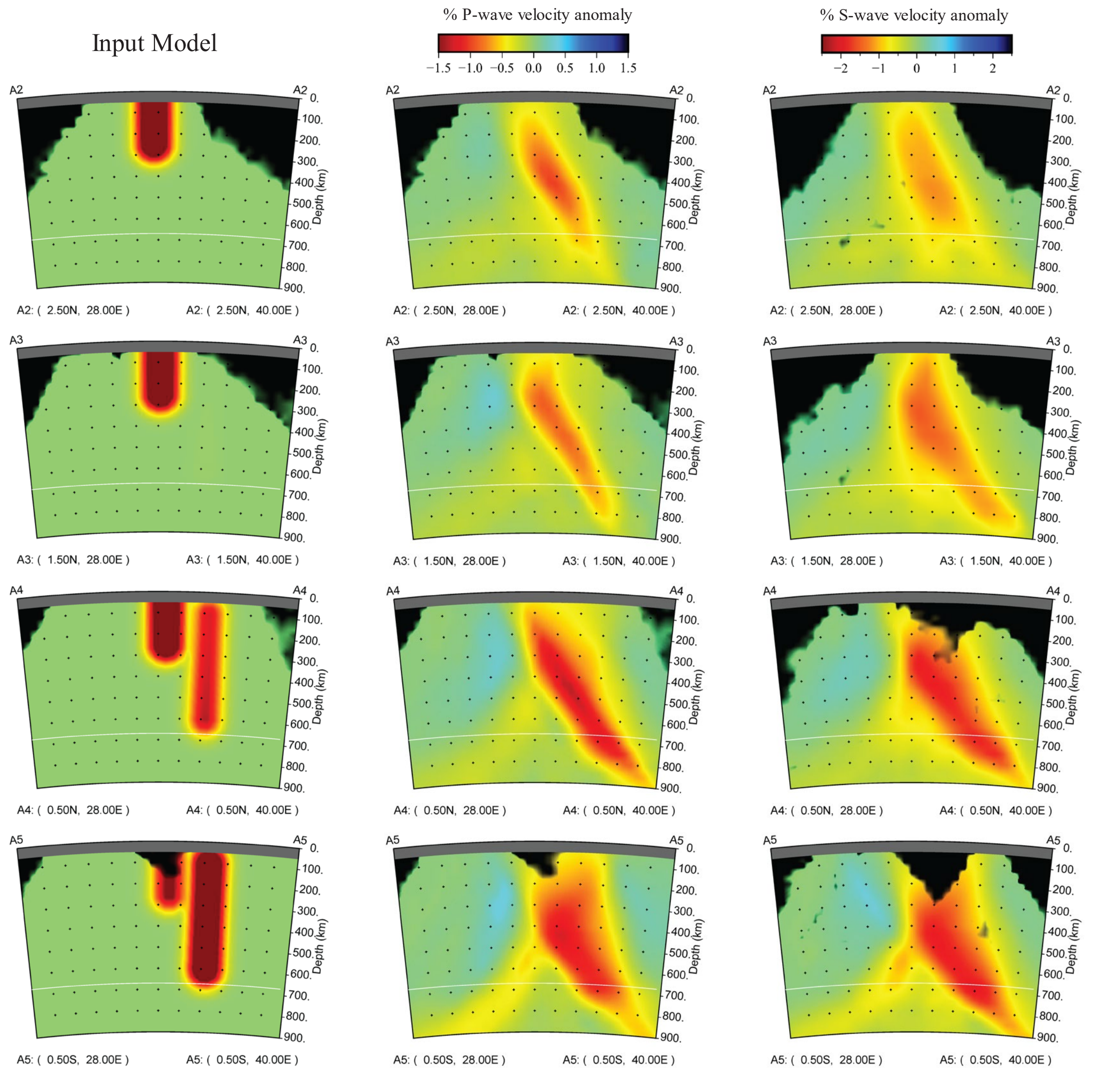

Figure **4-8**: Tabular body test input (left), P-wave model results (center) and S-wave model results (right) for A3-A3’, A4-A4’ and A5-A5’ vertical cross sections from Figures 4-1, 4-2. And 4-3. The input model has tabular bodies for both Feature B and the LWA from preview models.

Chapter 5

Summary and Conclusions

This thesis uses data from the AfricaArray Uganda Seismic Network, which was deployed from January 2017 to December 2018 to address the lack of available resolution in current tomographic models for the northern part of the East African Plateau. The data were combined with data from earlier networks to generate new P- and S-wave body-wave tomography models. The resulting models show the presence of two prominent features: (1) Anomaly A (δVp = ~-0.5 – -1.2% , δVs = 1.0 – 2.0%), a FWA in northern Uganda at depths of 100 km to 300 km, and (2) Anomaly B (δVp = ~+0.5 – +1.2% , δVs = +1.0 – +2.0%), a LWA spanning the eastern border of Uganda at depths of 100 km to 300 km. The checkerboard resolution tests show that both anomalies are well resolved using 200 km diameter checkers, except at the edges of the models. The 100 km checkers show adequate resolution of the anomalies in the P-wave model, but limited resolution in the S-wave model.

Anomaly A extends north of the ASZ, leading to two possible interpretations. The first, proposed by *Adams et al.* [2012], attributes the LWA in Uganda to an extension of the Tanzania Craton to the north. *Emry et al.* [2019], on the other hand, attributes the LWA to an extension of the Congo Craton to the southeast. The results of the body-wave tomography model show that the ASZ does not disrupt the continuity of the FWA at the upper mantle depths. Therefore, we cannot determine which of these interpretations is correct based on the body wave tomography.

Tabular body tests show that Anomaly B is within 25 km of the LWA imaged beneath the Kenya Rift in previous studies [*Adams et al.*, 2012; *Grijalva et al.*, 2018; *Mulibo and Nyblade*, 2013; *O'Donnell et al.*, 2013]. Given the proximity of the LWAs in the tabular body test, Anomaly B is likely an extension of the LWA beneath the Kenya Rift, which has been previously interpreted as part of the African superplume. We conclude that the African superplume in the Eastern Branch of the EARS continues northwest as it upwells around the thick lithosphere of the Tanzania Craton.

The results of this thesis advance our understanding of the upper mantle structure beneath the East African Plateau by showing that (1) thick cratonic lithosphere extends through northern Uganda beyond the surface expression of the ASZ and (2) thermally perturbed upper mantle beneath the northern part of the Kenya Rift extends to the west beneath the northeastern part of the East African Plateau and away from the rift proper.

The findings of this thesis can be followed extended by future works. A surface wave model using the same data collected from the NE Uganda AfricaArray Network could be generated to determine shallow (<150 km) structure in the study area. This would provide a more complete understanding of how Anomalies A and B in the upper mantle lithosphere relate to the crustal strucutre above. Additionally, a denser set of stations throughout Uganda could provide better resolution, particularly in the 100-km or lower range. The 100-km diameter checkerboards in this study are not well resolved. A denser network could yield a better understanding of smaller-scale structure in the region. Furthermore, an extension of the network—or practically, a new network—c ould be deployed in Northern Kenya to begin to resolve mantle structure beneath the northern section of the surface expression of the Kenya Rift and the Turkana Depression. The results of the body-wave tomography model may also be used in joint inversions of seismic and geodynamic data to determine the mechanism of geodynamic evolution of the study area.

Appendix A

Data & Methodology

A-1: NE Uganda AfricaArray Station List

Table **A-1**: Station IDs, latitude, longitude and elevation for stations in the NE Uganda AfricaArray Network.

Station ID	Latitude	Longitutde	Elevation (km)
AMDT	1.9480	34.9358	1.259
GULU	2.8778	32.2848	1.059
KABG	3.5104	34.1433	1.556
KITG	3.2920	32.8978	0.959
KOTD	3.0000	34.1104	1.251
KUMI	1.4769	33.8648	1.150
LANG	2.7402	33.5637	1.111
LIRA	2.1096	33.0643	1.080
NAPK	2.3692	34.3775	1.205

A-2: P-wave Model Station List

Table **A-2**: P -wave model station IDs with latitude and longitude locations and elevation above sea level.

Station ID	Network	Latitude	Longitude	Elevation (km)
103B	YQ	-9.7159	34.1118	-0.265
104	YQ	-9.7986	34.1565	-0.321
105	YQ	-9.8808	34.2049	-0.331
106	YQ	-9.9636	34.2504	-0.375
107	YQ	-10.0484	34.2981	-0.45
109	YQ	-10.218	34.3922	-0.492
110B	YQ	-10.3224	34.396	-0.485
111	YQ	-10.4263	34.4103	-0.458
112	YQ	-10.5291	34.4035	-0.454
114	YQ	-10.7366	34.4101	-0.514
115	YQ	-10.8407	34.4136	-0.563
116	YQ	-10.9653	34.419	-0.679
118B	YQ	-11.214	34.4297	-0.605
119	YQ	-11.3357	34.4437	-0.56
120	YQ	-11.4558	34.4369	-0.518
121	YQ	-11.5987	34.4413	-0.45
122	YQ	-11.6475	34.4483	-0.458
202	YQ	-10.0651	34.1113	-0.212
203B	YQ	-10.0314	34.1577	-0.312
204	YQ	-9.9974	34.2036	-0.386
206B	YQ	-9.9119	34.3199	-0.402
301	YQ	-10.8588	34.2593	-0.5
302B	YQ	-10.8528	34.308	-0.512
303	YQ	-10.8474	34.3593	-0.584
305	YQ	-10.8291	34.5229	-0.49
306	YQ	-10.8247	34.5794	-0.397
AMBA	XD	-8.106	33.2588	1.415
ANGA	XI	-2.5	36.8	0
BAKO	YQ	-8.8437	34.8016	1.651
BANG	YQ	-10.1128	35.6506	0.96
BARI	XI	0.4662	35.9806	1.012
BASO	XD	-4.3238	35.1382	1.694

BEND	ZP	0.581	31.392	1.351
BIHA	ZP	-2.638	31.316	1.459
BKBA	ZP	-1.364	31.812	1.274
BLWY	AF	-20.143	28.6113	1.348
BOBN	AF	-1.66	29.2367	1.529
BOKO	XI	-2.2557	37.7299	0.977
BOLE	YQ	-10.9796	33.7426	1.109
BUMI	YQ	-10.1277	34.9365	1.333
BUTI	ZP	1.819	31.326	0.623
CHAL	YH	-6.64	38.37	0.219
CHAM	ZP	-10.95	31.07	0
CHEL	YQ	-10.5869	33.8097	2.194
CHIM	ZP	-8.83	34.03	1.1
CHML	YQ	-8.8263	34.0284	1.118
CHUN	YQ	-8.5434	33.4337	1.527
CPMW	YQ	-9.7057	33.2692	1.272
CRTR	YQ	-9.3318	33.7512	0.916
DESE	AF	11.118	39.635	2.538
DODT	AF	-6.186	35.748	1.114
ENUK	YQ	-11.1799	33.8859	3.619
FOPO	ZP	0.663	30.282	1.535
GAWA	YQ	-8.7648	34.3864	1.127
GEIT	ZP	-2.881	32.217	1.281
GOMA	XD	-4.8392	29.6927	0.88
HALE	XD	-5.3018	38.617	0.23
HAMA	ZP	-3.832	32.642	1.227
IFAK	YH	-8.14	36.68	0.251
IGOM	YQ	-9.0019	33.6581	2.364
ILIN	ZP	-9.0819	33.3327	1.919
ILOM	YQ	-9.2829	33.3421	2.11
INDI	YH	-10.02	39.71	0.014
INZA	XD	-5.1168	30.3988	0.975
IRIN	ZP	-7.76	35.69	1.561
ISOK	ZP,YQ	-9.509	33.4944	1.443
ISOK	ZP	-10.1708	32.6457	1.301
ITUM	YQ	-9.4005	33.188	1.365
JILO	YQ	-8.7261	33.5664	2.002
JNJA	ZP	0.446	33.182	1.133
KAKA	XI	0.5587	34.7963	1.477

KALO	YQ	-9.9111	33.6448	1.065
KAMZ	ZP	-14.7948	24.8044	1.161
KAPK	YQ	-9.7801	33.4574	1.357
KAPO	YQ	-9.7851	33.8208	0.533
KARM	YQ	-9.9541	33.8954	0.527
KASM	ZP	-10.22	31.14	0
KATE	ZP	-0.138	29.871	0.95
KBLE	ZP	-1.254	29.992	1.876
KGMA	ZP	-4.878	29.633	0.821
KIBA	XD	-5.3223	36.5695	1.5
KIBE	XD	-5.3775	37.4763	0.997
KIBO	XI,ZP	-3.583	30.713	1.485
KIDE	YQ	-9.2745	35.0214	1.76
KIFA	YQ	-9.5472	35.1026	1.742
KIMA	YH	-8.92	39.51	0.007
KIMO	YQ	-10.6922	36.0463	0.841
KIPE	YQ	-9.2891	34.4382	2.224
KISH	ZP	-12.02	29.61	0
KISZ	ZP	-12.1116	25.4952	1.358
KITU	XI	-1.373	38.0021	1.129
KMBO	IU	-1.127	37.25	1.95
KMPZ	ZP	-13.4568	25.8337	1.251
KOMO	XD	-3.8422	36.7192	1.114
KOND	XD	-4.904	35.7965	1.419
KR03	KR	-0.2928	35.165	1.75
KR05	KR	0.5833	35.496	2.37
KR07	KR	-0.2413	35.7458	2.43
KR08	KR	0.5675	35.7095	1.64
KR09	KR	-0.3687	35.923	2.29
KR12	KR	-0.1012	35.9387	1.71
KR16	KR	0.402	36.2905	2.12
KR17	KR	-0.8508	36.3683	1.997
KR22	KR	0.2238	36.5833	1.85
KR24	KR	-0.168	36.6305	2.58
KR27	KR	-0.1335	36.8883	1.92
KR29	KR	-0.0348	37.03	2.4
KR30	KR	-1.0245	37.1637	1.475
KR31	KR	-0.0678	37.2455	2.27
KR32	KR	0.3568	37.5497	2.02

KR35	KR	0.2867	37.8835	2.22
KR42	KR	0.038	35.7263	2.157
KT01	KR	-1.4387	36.6545	1.98
KT02	KR	-1.4913	36.4748	1.02
KT03	KR	-1.3477	36.1352	1.43
KT04	KR	-1.4467	35.843	1.85
KT05	KR	-1.0485	36.5875	1.75
KT06	KR	-1.0528	36.2956	1.64
KT07	KR	-1.1507	35.9158	1.91
KT08	KR	-0.8072	36.6783	2.5
KT09	KR	-0.7862	36.2823	1.92
KT10	KR	-0.7422	35.9733	2.77
KT11	KR	-0.8177	35.9008	2.46
KT13	KR	-0.4608	36.2197	1.79
KT14	KR	-0.4653	36.0353	2.06
KT15	KR	-0.89	36.096	2.88
KT16	KR	-0.7442	36.2622	1.92
KT17	KR	-0.5233	36.6642	3.2
KT18	KR	-1.0445	36.6863	2.22
KT20	KR	-1.269	36.1047	1.67
KT21	KR	-1.16	35.917	1.91
KT22	KR	-1.5068	35.8225	2
KT24	KR	-1.129	35.782	1.92
KT25	KR	-1.088	36.424	1.595
KT31	KR	-1.2352	35.023	1.68
KT32	KR	-1.1867	35.25	1.78
KT33	KR	-1.152	35.5833	1.92
KT40	KR	-0.9675	37.4727	1.13
KT41	KR	-0.964	37.7095	1.1
KT42	KR	-0.8318	38.0855	0.96
KT43	KR	-0.83	38.339	0.77
KT45	KR	-0.733	38.8095	0.57
KT46	KR	-0.6275	39.2788	0.29
KT47	KR	-0.4208	39.6313	0.14
KTWE	AF	-12.81	28.21	0
KURU	YQ	-11.1996	35.4577	0.751
KYLA	ZP	-9.5986	33.8673	0.501
L07	KR	0.4982	35.908	1.25
L16	KR	0.6978	36.0892	1.04

L17	KR	0.7167	36.146	1.08
L19	KR	0.7897	36.2777	1.32
LAEL	ZP	-8.57	32.06	1.596
LBB	AF	-11.631	27.485	1.283
LIGA	YQ	-10.6835	35.2545	0.976
LIVA	YQ	-10.6138	34.107	1.371
LONG	XD	-2.7252	36.6983	1.38
LOSI	YQ	-8.3872	33.1682	1.233
LOSS	ZP	-8.42	33.16	1.195
LSZ	IU	-15.28	28.19	0
LWNG	ZP	-10.25	29.92	0
MAFI	ZP	-8.31	35.31	1.866
MAKA	ZP	-8.85	34.83	1.685
MAKE	YQ	-9.2613	34.0969	2.304
MALE	ZP	1.07	34.167	1.127
MAND	YQ	-10.4782	34.6005	0.511
MANG	YH	-7.2	38.77	0.366
MANS	ZP	-11.14	28.87	0
MATA	YQ	-8.9614	33.9697	2.074
MAUS	ZP	-2.74	36.7	1.334
MBAM	YQ	-11.2484	34.7919	0.56
MBAR	II	-0.6019	30.7382	1.39
MBEY	YQ	-8.983	33.241	1.331
MBHS	YQ	-9.4309	33.9812	0.56
MBWE	XD	-4.96	34.35	1.1
MFRI	YQ	-9.2944	35.3129	1.604
MGOR	ZP	-6.83	37.67	0.501
MIKU	ZP	-7.4	36.99	0.518
MITU	XD	-6.02	34.06	1.566
MKIL	YQ	-10.8807	34.6813	0.49
MKRE	ZP	-4.28	30.42	1.175
MKUS	ZP	-13.6	29.38	0
MLBA	ZP	-1.84	31.67	1.337
MLOW	YQ	-10.7827	34.2072	0.513
MOHO	YH	-8.14	39.18	0.004
MONG	AF	-15.15	23.09	1.046
MPIK	ZP	-11.82	31.45	0
MTAN	XD	-7.91	33.32	1.393
MTOR	XD	-5.25	35.4	1.1

MTVE	AF	-10.25	40.167	0.021
MTWA	YH	-10.28	40.19	0.032
MUDI	YQ	-9.8621	34.9373	1.397
MUFZ	ZP	-13.1442	25.0213	1.189
MWEN	ZP	-10.06	28.7	0
MZM	AF	-11.43	34.03	0
MZUN	YQ	-9.1523	33.5217	1.399
NAMA	ZP	-7.51	31.04	1.559
NARO	XI	-1.0733	35.8654	1.922
NBI	AF	-1.2739	36.8037	1.713
NDEI	XI	-2.6928	38.1687	0.732
NGEA	YQ	-10.6754	35.6744	1.2
NGON	YQ	-10.9387	33.9428	1.06
NIND	YQ	-10.1421	34.5792	1.292
NJOM	ZP	-9.37	34.79	1.949
NKAL	YQ	-9.1881	33.7736	1.551
NTHA	YQ	-10.3521	33.6372	1.291
PAND	XD	-8.98	33.24	1.248
PIGI	ZP	0.231	32.319	1.252
PNDA	ZP	-6.35	31.06	1.071
PUGE	XD	-4.71	33.18	1.35
PWET	AF	-8.28	28.53	0
ROTI	ZP	1.626	33.6	1.108
RUNG	XD	-6.94	33.52	1.23
SAKA	ZP	-0.315	31.737	1.263
SCH	YQ	-10.1754	34.0324	0.529
SERJ	ZP	-13.23	30.21	0
SHWG	ZP	-11.19	31.74	0
SING	XD	-4.64	34.73	1.462
SONG	ZP	-10.67	35.65	1.119
SULU	ZP	-4.573	30.087	1.359
SUMB	ZP	-7.95	31.62	1.837
TALE	XI	0.9792	34.976	1.821
TARA	XD	-3.89	36.02	1.268
TEBE	AF	0.0536	32.483	1.132
TEZI	AF	-15.747	26.016	1.115
THAN	YQ	-11.4683	34.1842	0.683
THAZ	YQ	-10.8305	33.5924	1.695
TIRI	YQ	-10.7626	34.8831	1.295

TOLA	YQ	-9.5921	34.5841	2.201
TUND	XD,ZP	-9.3	32.77	1.66
UKWA	YQ	-9.4539	34.2158	2.143
UNDA	YQ	-9.8536	34.4738	1.767
URAM	XD	-5.09	32.08	1.12
UVZA	ZP	-5.1	30.39	0.992
UWEM	YQ	-9.4696	34.7859	2.151
VWZM	YQ	-11.1753	33.5744	1.134
W40	KR	0.2463	35.3493	2.28
W41	KR	0.055	35.4743	2.44
W42	KR	-0.108	35.7113	2.853
W43	KR	-0.418	35.731	2.82
W44	KR	-0.5653	35.8355	2.8
W45	KR	0.295	35.8033	1.81
W46	KR	-0.5757	36.032	2.568
W47	KR	0.239	36.0725	1.16
W48	KR	-0.0542	36.1215	1.75
W49	KR	-0.46	36.22	1.79
W50	KR	-0.3277	36.3195	2.57
W51	KR	-0.1065	36.4577	2.56
W52	KR	0.0623	36.673	1.96
W53	KR	0.1167	37.0217	1.8
WALE	YH	-9.79	37.92	0.507
WENY	YQ	-10.1579	33.5574	1.516
WINO	ZP	-9.7576	35.3001	1.486
ZINI	YQ	-10.4659	35.3383	1.044
ZOMB	AF	-15.3833	35.35	0.885

A-3: S-wave Model Station List

Table **A-3**: S-wave model station IDs with latitude and longitude locations and elevation above sea level.

Station ID	Network	Latitude	Longitude	Elevation (km)
103B	YQ	-9.7159	34.1118	-0.265
110B	YQ	-10.3224	34.3960	-0.485
118B	YQ	-11.2140	34.4297	-0.605
203B	YQ	-10.0314	34.1577	-0.312
206B	YQ	-9.9119	34.3199	-0.402
302B	YQ	-10.8528	34.3080	-0.512
AMBA	XI	-8.1060	33.2588	1.415
ANGA	XI	-2.5000	36.8000	0.000
ANKE	AF	9.5827	39.7418	2.789
BAKO	YQ	-8.8437	34.8016	1.651
BANG	YQ	-10.1128	35.6506	0.960
BASO	XD	-4.3238	35.1382	1.694
BIHA	ZP	-2.6380	31.3160	1.459
BOBN	AF	-1.6600	29.2367	1.529
BOKO	XI	-2.2557	37.7299	0.977
BOLE	YQ	-10.9796	33.7426	1.109
BUMI	YQ	-10.1277	34.9365	1.333
CHAL	YH	-6.6400	38.3700	0.219
CHAM	ZP	-10.9500	31.0700	0.000
CHEL	YQ	-10.5869	33.8097	2.194
CHIM	ZP	-8.8300	34.0300	1.100
CHML	YQ	-8.8263	34.0284	1.118
CHUN	YQ	-8.5434	33.4337	1.527
CPMW	YQ	-9.7057	33.2692	1.272
CRTR	YQ	-9.3318	33.7512	0.916
DESE	AF	11.1180	39.6350	2.538
DODT	AF	-6.1860	35.7480	1.114
ENUK	YQ	-11.1799	33.8859	3.619
GAWA	YQ	-8.7648	34.3864	1.127
GEIT	ZP	-2.8810	32.2170	1.281
GOMA	XD	-4.8392	29.6927	0.880
HALE	XD	-5.3018	38.6170	0.230
HAMA	ZP	-3.8320	32.6420	1.227
IFAK	H	-8.1400	36.6800	0.251

IGOM	YQ	-9.0019	33.6581	2.364
ILIN	ZP	-9.0819	33.3327	1.919
ILOM	YQ	-9.2829	33.3421	2.110
INDI	YH	-10.0200	39.7100	0.014
INZA	XD	-5.1168	30.3988	0.975
IRIN	ZP	-7.7600	35.6900	1.561
ISOK	ZP,YQ	-9.5090	33.4944	1.443
ISOK	ZP	-10.1708	32.6457	1.301
ITUM	YQ	-9.4005	33.1880	1.365
JILO	YQ	-8.7261	33.5664	2.002
KALO	YQ	-9.9111	33.6448	1.065
KAMZ	ZP	-14.7948	24.8044	1.161
KAPK	YQ	-9.7801	33.4574	1.357
KAPO	YQ	-9.7851	33.8208	0.533
KARM	YQ	-9.9541	33.8954	0.527
KASM	ZP	-10.2200	31.1400	0.000
KGMA	ZP	-4.8780	29.6330	0.821
KIBA	XD	-5.3223	36.5695	1.500
KIBE	XD	-5.3775	37.4763	0.997
KIBO	ZI,ZP	-3.5830	30.7130	1.485
KIDE	YQ	-9.2745	35.0214	1.760
KIFA	YQ	-9.5472	35.1026	1.742
KIMA	YH	-8.9200	39.5100	0.007
KIMO	YQ	-10.6922	36.0463	0.841
KIPE	YQ	-9.2891	34.4382	2.224
KISH	ZP	-12.0200	29.6100	0.000
KISZ	ZP	-12.1116	25.4952	1.358
KMBO	IU	-1.1270	37.2500	1.950
KMPZ	ZP	-13.4568	25.8337	1.251
KOMO	XD	-3.8422	36.7192	1.114
KOND	XD	-4.9040	35.7965	1.419
KTWE	AF	-12.8100	28.2100	0.000
KURU	YQ	-11.1996	35.4577	0.751
KYLA	ZP	-9.6000	33.8700	0.501
LAEL	ZP	-8.5700	32.0600	1.596
LBB	AF	-11.6310	27.4850	1.283
LIGA	YQ	-10.6835	35.2545	0.976
LIVA	YQ	-10.6138	34.1070	1.371
LOSI	YQ	-8.3872	33.1682	1.233
LOSS	ZP	-8.4200	33.1600	1.195
LSZ	IU	-15.2800	28.1900	0.000
LWNG	ZP	-10.2500	29.9200	0.000

MAFI	ZP	-8.3100	35.3100	1.866
MAKA	ZP	-8.8500	34.8300	1.685
MAKE	YQ	-9.2613	34.0969	2.304
MAND	YQ	-10.4782	34.6005	0.511
MANG	YH	-7.2000	38.7700	0.366
MANS	ZP	-11.1400	28.8700	0.000
MATA	YQ	-8.9614	33.9697	2.074
MAUS	ZP	-2.7400	36.7000	1.334
MBAM	YQ	-11.2484	34.7919	0.560
MBAR	II	-0.6019	30.7382	1.390
MBEY	YQ	-8.9830	33.2410	1.331
MBHS	YQ	-9.4309	33.9812	0.560
MBWE	YQ	-4.9600	34.3500	1.100
MFRI	YQ	-9.2944	35.3129	1.604
MGOR	ZP	-6.8300	37.6700	0.501
MIKU	ZP	-7.4000	36.9900	0.518
MITU	ZP	-6.0200	34.0600	1.566
MKIL	YQ	-10.8807	34.6813	0.490
MKRE	ZP	-4.2800	30.4200	1.175
MKUS	ZP	-13.6000	29.3800	0.000
MLBA	ZP	-1.8400	31.6700	1.337
MLOW	YQ	-10.7827	34.2072	0.513
MOHO	YH	-8.1400	39.1800	0.004
MONG	AF	-15.1500	23.0900	1.046
MPIK	ZP	-11.8200	31.4500	0.000
MTAN	XD	-7.9100	33.3200	1.393
MTOR	XD	-5.2500	35.4000	1.100
MTVE	AF	-10.2500	40.1670	0.021
MTWA	YH	-10.2800	40.1900	0.032
MUDI	YQ	-9.8621	34.9373	1.397
MUFZ	ZP	-13.1442	25.0213	1.189
MWEN	ZP	-10.0600	28.7000	0.000
MZM	AF	-11.4300	34.0300	0.000
MZUN	YQ	-9.1523	33.5217	1.399
NAMA	ZP	-7.5100	31.0400	1.559
NBI	AF	-1.2739	36.8037	1.713
NDEI	XI	-2.6928	38.1687	0.732
NGEA	YQ	-10.6754	35.6744	1.200
NGON	YQ	-10.9387	33.9428	1.060
NIND	YQ	-10.1421	34.5792	1.292
NJOM	ZP	-9.3700	34.7900	1.949
NKAL	YQ	-9.1881	33.7736	1.551

NTHA	YQ	-10.3521	33.6372	1.291
PAND	XD	-8.9800	33.2400	1.248
PNDA	ZP	-6.3500	31.0600	1.071
PUGE	XD	-4.7100	33.1800	1.350
PWET	AF	-8.2800	28.5300	0.000
RUNG	XD	-6.9400	33.5200	1.230
SCH	YQ	-10.1754	34.0324	0.529
SERJ	ZP	-13.2300	30.2100	0.000
SHWG	ZP	-11.1900	31.7400	0.000
SING	XD	-4.6400	34.7300	1.462
SONG	ZP	-10.6700	35.6500	1.119
SULU	ZP	-4.5730	30.0870	1.359
SUMB	ZP	-7.9500	31.6200	1.837
TARA	XD	-3.8900	36.0200	1.268
TEBE	AF	0.0536	32.4830	1.132
TETE	AF	-16.1300	33.5700	0.159
TEZI	AF	-15.7470	26.0160	1.115
THAN	YQ	-11.4683	34.1842	0.683
TIRI	YQ	-10.7626	34.8831	1.295
TOLA	YQ	-9.5921	34.5841	2.201
TUND	XD,ZP	-9.3000	32.7700	1.660
UKWA	YQ	-9.4539	34.2158	2.143
UNDA	YQ	-9.8536	34.4738	1.767
URAM	XD	-5.0900	32.0800	1.120
UVZA	ZP	-5.1000	30.3900	0.992
UWEM	YQ	-9.4696	34.7859	2.151
VWZM	YQ	-11.1753	33.5744	1.134
WALE	YH	-9.7900	37.9200	0.507
WENY	YQ	-10.1579	33.5574	1.516
WINO	ZP	-9.7576	35.3001	1.486
ZINI	YQ	-10.4659	35.3383	1.044
ZOMB	AF	-15.3833	35.3500	0.885

A-4: P-wave Model Event List

Table **A-4**: Table of details for events used in P-wave model.

Year	Month	Day	Hour	Min.	Latitude	Longitude	Depth (km)	Magnitude
2001	7	13	19	48.92	28.75	-43.44	10	5.7
2001	7	25	21	56.69	0.04	122.97	156	5.6
2001	7	26	0	21.69	39.06	24.24	10	6.6
2001	7	31	9	43.45	-5.28	103.34	33	5.7
2001	8	5	5	16.68	12.22	93.35	96	5.9
2001	8	7	3	22.58	-8.61	113.83	90	5.6
2001	8	16	18	50.89	-36.71	78.67	10	5.5
2001	10	14	1	10.56	-8.6	110.63	67	5.8
2001	11	18	21	59.25	35.73	93.69	10	5.9
2001	11	19	17	45.34	35.76	93.67	10	5.7
2001	11	23	20	43.35	36.39	71.51	106	6.1
2001	11	27	7	31.23	29.61	81.75	33	5.6
2001	12	4	18	9.66	18.96	120.24	33	5.6
2001	12	9	18	15.26	0	122.87	156	6.1
2001	12	12	14	2.5	-42.81	124.69	10	7.1
2001	12	13	13	50.63	27.04	-44.5	10	5.7
2001	12	18	4	2.82	23.95	122.73	14	7.3
2002	1	15	7	12.8	-6.31	105.21	10	6.3
2002	1	22	4	53.26	35.79	26.62	88	6.2
2002	1	24	17	52.54	3.54	95.66	33	5.6
2002	1	24	18	12.52	3.53	95.66	33	5.7
2002	2	3	9	26.33	38.63	30.9	10	6
2002	2	12	3	27.59	23.72	121.56	54	5.8
2002	3	3	12	8.78	36.43	70.44	209	6.3
2002	3	3	12	8.97	36.5	70.48	225	7.4
2002	3	5	21	16.91	6.03	124.25	31	7.5
2002	3	8	18	27.31	5.87	124.27	23	6
2002	3	31	6	52.04	24.28	122.18	32	7.4
2007	8	13	22	23.44	-30.99	-13.41	10	5.5
2007	8	16	14	18.46	-3.52	-12.15	10	5.5
2007	8	18	4	38.34	2.08	96.69	30	5
2007	8	19	0	4.12	-60.39	-26.86	30	5.5
2007	8	20	12	37.66	-0.26	-18.17	10	5.7
2007	8	21	16	36.53	8.01	-38.97	10	5.3
2007	8	25	4	24.19	28.15	56.65	10	5

2007	8	25	17	3.78	14.29	93.99	65	5.2
2007	8	25	22	5.96	39.28	41.12	10	5.3
2007	8	29	3	0.79	21.78	121.43	24	5.4
2007	8	30	7	34.38	-49.58	117.4	10	5.1
2007	8	30	11	7.89	1.8	99.32	145	5.4
2007	9	1	1	28.28	27.84	-43.99	10	5.2
2007	9	6	17	51.61	24.34	122.22	53	6.2
2007	9	9	2	0.14	30.61	69.79	20	5.3
2007	9	12	11	10.68	-4.44	101.37	34	8.5
2007	9	12	14	40.57	-3.16	101.46	35	5.9
2007	9	12	16	37.39	-3.14	101.4	35	5.8
2007	9	13	1	26.44	-1.9	99.82	16	5.7
2007	9	13	2	30.33	-1.69	99.67	28	6.5
2007	9	13	3	35.87	-2.13	99.63	22	7
2007	9	13	5	23.32	-1.72	99.64	32	5.5
2007	9	13	13	10.44	-2.75	100.97	17	5.5
2007	9	13	15	8.46	-4.3	101.27	24	5.2
2007	9	13	16	9.68	-3.17	101.52	53	6
2007	9	14	1	2.53	-3.78	101.83	26	5.4
2007	9	14	6	1.22	-4.07	101.17	23	6.4
2007	9	15	14	26.96	-4.23	101.22	35	5
2007	9	16	1	15.89	-2.76	101.11	38	5.2
2007	9	16	11	37.39	-2.83	101.2	35	5.3
2007	9	17	15	55.09	-3.64	100.77	25	5.1
2007	9	18	8	41.27	-3.26	101.35	35	5.6
2007	9	18	10	3.21	0.13	97.71	25	5.1
2007	9	19	7	27.07	-2.75	100.89	35	6
2007	9	19	17	16.62	-32.24	-13.92	10	5.4
2007	9	20	0	50.93	-4.3	101.23	27	5
2007	9	20	8	31.44	-2	100.14	30	6.7
2007	9	20	9	29.81	-10.38	117.01	35	5.7
2007	9	22	6	35.72	42.88	-31.87	10	5.2
2007	9	23	0	54.96	35.27	27.12	24	5.3
2007	9	23	14	13.39	-2.13	99.93	28	5.5
2007	9	23	22	23.72	-3.68	100.85	35	5.4
2007	9	24	8	15.51	-3.15	100.36	18	5.7
2007	9	24	12	26.09	-4.39	101.46	35	5.3
2007	9	24	17	35.91	-5.88	105.57	35	5
2007	9	25	8	27.44	-1.77	100.46	35	5.3
2007	9	26	15	43.14	-1.79	99.49	26	6.1
2007	9	26	18	36.05	-1.83	99.46	24	5.1
2007	9	29	5	32.2	2.91	95.53	20	5.7

2007	10	2	3	43.89	-4.24	101.21	22	5.9
2007	10	2	14	39.88	-1.85	99.78	35	5.1
2007	10	2	16	34.66	57.49	-33.03	10	5.3
2007	10	4	12	40.11	2.54	92.9	35	6.2
2007	10	4	14	28.56	-8.28	116.81	10	5.7
2007	10	5	9	22.64	-4.38	101.34	35	5.1
2007	10	8	8	18.18	-42.01	-16.25	10	5.1
2007	10	9	3	22.67	-6.59	71.53	10	5.4
2007	10	9	7	22.26	-54.68	1.01	10	5.2
2007	10	10	12	25.66	9.7	91.8	36	5.2
2007	10	11	20	38.53	-3.9	100.98	35	5.4
2007	10	12	0	31.91	-3.29	100.51	15	5.7
2007	10	17	14	40.04	23.5	121.71	51	5
2007	10	18	16	13.4	30.13	-42.59	10	5.7
2007	10	19	7	19.47	28.65	66.29	35	5.5
2007	10	21	16	25.5	-3.59	100.86	27	5.6
2007	10	23	19	56.73	-2	99.9	30	5.8
2007	10	24	21	2.06	-3.9	101.02	21	6.8
2007	10	25	5	25.35	-3.54	100.79	29	5.5
2007	10	26	6	50.66	35.3	76.75	10	5.2
2007	10	31	9	6.45	49.85	91.68	28	5.1
2007	10	31	15	54.26	-2.99	101.28	48	5.3
2007	11	4	20	35.73	-67.03	111.2	10	5.7
2007	11	6	2	15.67	38.15	73.26	131	5.5
2007	11	8	7	44.1	-55.98	-27.93	90	5.4
2007	11	10	23	19.33	-3.28	100.53	15	5.9
2007	11	16	21	23.61	2.62	94.49	27	5.1
2007	11	17	8	42.97	-1.19	-13.16	10	5.2
2007	11	20	22	59.86	-4.33	101.26	35	5.4
2007	11	22	3	44.07	26.87	54.69	14	5.3
2007	11	22	23	2.29	4.74	95.06	49	5.8
2007	11	23	19	18.74	-53.27	9.43	10	5.5
2007	11	25	2	51.72	-2.81	101.16	55	5.9
2007	11	25	13	53.73	29.65	69.52	35	5.1
2007	11	25	16	2.57	-8.29	118.37	20	6.5
2007	11	25	17	41.8	-2.24	100.41	35	6
2007	11	25	19	53.54	-8.22	118.47	18	6.5
2007	11	26	8	14.43	-8.21	118.69	35	5.3
2007	11	26	11	3.85	-2.26	100.46	35	5
2007	11	27	4	26.85	16.06	119.84	35	5.9
2007	11	27	10	13.96	-1.36	-13.29	10	5.4
2007	11	28	10	5.94	-2.26	100.53	50	5.2

2007	11	29	0	5.71	-2.86	101.14	35	5.4
2007	12	1	1	44.19	1.98	97.88	44	5.9
2007	12	1	23	1.29	-7.07	105.99	87	5
2007	12	2	6	33.8	-2.28	100.45	51	5.3
2007	12	6	17	12.32	22.69	-45.11	10	5.8
2007	12	7	10	45.37	-9.98	113.47	10	5.3
2007	12	8	3	54.6	-60.51	-52.38	10	5.8
2007	12	11	15	56.86	34.99	77.48	15	5.1
2007	12	12	15	22.87	15.34	119.89	62	5
2007	12	13	7	9.3	-23.98	69.57	10	5.1
2007	12	13	18	51.89	-40.98	-16.67	10	5.1
2007	12	17	0	9.72	-9.22	112.39	48	5
2007	12	17	12	46.46	-10.76	113.36	10	5.3
2007	12	20	9	48.99	39.42	33.21	10	5.7
2007	12	28	5	24.48	5.42	95.66	20	5.4
2008	1	1	6	32.79	40.29	72.99	6	5.6
2008	1	3	11	15.85	-5.92	122.66	10	5.4
2008	1	4	7	29.83	-2.78	101.03	35	6
2008	1	5	20	1.5	5.48	94.68	57	5.3
2008	1	6	5	14.01	37.22	22.69	75	6.2
2008	1	9	8	26.54	32.29	85.17	10	6.4
2008	1	12	8	32.67	-56.4	-27.21	89	5.3
2008	1	13	12	15.56	17.05	120.99	10	5.7
2008	1	14	1	20.26	-35.4	53.88	10	5.4
2008	1	14	13	38.59	10.41	92.87	34	5.9
2008	1	16	11	54.41	32.33	85.16	9	5.9
2008	1	20	5	13.13	-59.33	-23.51	10	5.1
2008	1	22	17	14.2	0.92	97.46	10	5.4
2008	1	22	18	43.27	32.35	85.26	5	5.5
2008	1	24	12	3.04	-4.03	101.87	35	5.3
2008	1	29	14	57.62	-58.74	-25.24	35	5.6
2008	2	4	3	32.88	18.15	122.54	20	5.1
2008	2	5	5	56.69	-3.52	118.07	13	5.9
2008	2	7	7	50.52	1.23	122.65	35	5.8
2008	2	7	20	58.89	-7.58	116.82	321	5.7
2008	2	8	9	38.41	10.67	-41.9	9	6.9
2008	2	10	12	22.26	-60.8	-25.59	8	6.6
2008	2	12	1	29.09	-3.01	101.21	47	5.5
2008	2	14	7	33.68	-54.42	5.35	10	5.1
2008	2	14	10	9.27	36.5	21.67	29	6.9
2008	2	14	12	8.57	36.35	21.86	28	6.5
2008	2	15	10	36.9	33.33	35.31	10	5.1

2008	2	17	20	33.31	23.28	121.45	19	5.4
2008	2	19	6	29.39	-3.29	100.93	35	5.3
2008	2	19	16	57.78	20.28	121.1	10	5.2
2008	2	19	17	1.96	-2.43	99.95	14	5.4
2008	2	20	2	12.9	-53.03	-46.62	10	5.1
2008	2	20	8	8.05	2.77	95.96	26	7.4
2008	2	20	12	11.07	-52.92	-46.49	10	5.5
2008	2	20	18	27.6	36.29	21.77	9	6.2
2008	2	21	2	46.81	77.08	18.57	12	6.1
2008	2	23	7	17.14	-2.51	99.96	32	5.6
2008	2	23	11	3.49	40.68	-29.4	10	5.3
2008	2	23	12	35.19	40.68	-29.34	10	5.1
2008	2	23	15	57.04	-57.33	-23.43	14	6.8
2008	2	23	17	58.41	-57.03	-23.53	10	5
2008	2	24	14	40.99	-2.47	99.96	22	5.3
2008	2	25	8	36.3	-2.49	99.97	25	7.2
2008	2	25	13	33.1	-2.31	99.97	35	5.3
2008	2	25	18	6.39	-2.33	99.89	25	6.6
2008	2	25	21	2.84	-2.24	99.81	25	6.7
2008	2	26	10	31.43	-57.2	-23.51	35	5.1
2008	2	26	18	18.75	-3.85	101.07	20	5.9
2008	2	29	8	18.05	3.93	93.48	35	5.6
2008	2	29	16	10.85	-53.01	-46.44	10	5.4
2008	3	1	21	13.62	-4.44	101.33	27	5.3
2008	3	2	0	19.96	36.43	-33.82	10	5.3
2008	3	3	2	37.71	-2.18	99.82	25	6.2
2008	3	3	13	49.04	19.91	121.33	10	6
2008	3	3	17	48.21	-4.47	101.45	27	5.6
2008	3	3	18	1.07	14.23	56.57	10	5.4
2008	3	3	21	11.37	-4.45	101.46	33	5.4
2008	3	4	17	31.67	23.12	120.82	11	5.2
2008	3	6	3	36.46	-2.23	99.79	35	5.3
2008	3	9	3	51.7	33.3	59.2	4	5
2008	3	9	15	27.13	-58.06	-24.91	42	5.1
2008	3	13	13	28.48	-45.49	35.01	10	6
2008	3	15	14	43.65	2.71	94.6	25	6
2008	3	16	23	5.55	-2.9	101.1	35	5.2
2008	3	20	22	32.79	35.49	81.47	10	7.2
2008	3	26	10	39.79	35.7	81.71	10	5.2
2008	3	28	0	16.99	34.76	25.34	45	5.6
2008	3	28	22	41.22	20.25	121.95	10	5.8
2008	3	29	8	9.77	20.27	121.98	16	5.5

2008	3	29	17	30.01	2.86	95.3	20	6.3
2008	3	30	8	32.7	37.84	101.84	10	5.1
2008	3	30	22	12.14	0.11	98.24	49	5.2
2008	4	1	1	31.07	20.2	122.06	10	5.2
2008	4	1	11	5.37	-38.94	46.31	10	5.4
2008	4	1	13	9.39	20.27	122.04	35	5.4
2008	4	2	8	48.97	-4.35	102.72	67	5.7
2008	4	2	14	36.07	-4.88	69.24	10	5.7
2008	4	3	6	19.41	-4.91	69.19	10	5.1
2008	4	4	0	27.84	2.9	95.43	36	5.2
2008	4	4	5	43.91	2.63	96.12	25	5
2008	4	12	8	49.41	-15.25	67.06	10	5.1
2008	4	13	23	29.21	13.39	-44.87	10	5.1
2008	4	14	9	45.97	-56.02	-28.03	140	6
2008	4	17	8	29.79	8.26	91.78	35	5.1
2008	4	23	0	0.77	-25.76	-45.47	10	5.2
2008	4	23	18	28.18	22.88	121.62	10	6
2008	4	23	22	4.54	22.88	121.65	6	5.1
2008	4	24	12	14.99	-1.18	-23.47	10	6.5
2008	4	27	5	2.99	-7.78	107.88	40	5
2008	4	27	14	35.92	-35.46	-16.6	10	5.6
2008	4	28	15	31.73	-58.69	-24.78	35	5.2
2008	5	1	17	44.46	-2.87	101.21	49	5
2008	5	5	21	57.38	28.37	54.05	46	5.2
2008	5	6	23	27.76	-7.86	123.15	212	5.4
2008	5	10	19	41.93	24.04	122.57	16	5.6
2008	5	11	20	57.83	36.41	70.75	218	5.4
2008	5	12	6	28.15	31	103.32	19	7.9
2008	5	12	9	7.04	31.21	103.68	10	5
2008	5	12	11	11.24	31.21	103.62	10	6.1
2008	5	12	13	40.41	31.03	103.51	10	5
2008	5	12	14	15.73	32.12	104.65	18	5
2008	5	12	20	8.04	31.41	103.89	21	5.6
2008	5	12	22	57.51	24.08	122.57	29	5
2008	5	13	7	7.85	30.89	103.19	9	5.8
2008	5	13	10	29.93	4.68	95.09	35	5.4
2008	5	13	14	14.13	16.46	122.25	44	5.2
2008	5	13	21	48.26	16.48	122.24	53	5.3
2008	5	14	2	54.99	31.33	103.52	18	5.4
2008	5	14	5	54.79	32	104.03	10	5.1
2008	5	14	9	26.39	31.36	104.01	10	5.1
2008	5	14	21	1.7	31.66	104.21	10	5.1

2008	5	17	17	8.54	32.24	104.98	9	5.8
2008	5	18	12	17.33	-3.2	101.41	32	5.7
2008	5	19	3	16.36	-47.78	31.97	10	5.9
2008	5	19	4	8.86	32.4	105.04	10	5
2008	5	19	14	26.5	1.64	99.15	10	6
2008	5	20	17	8.02	-3.18	101.47	47	5.7
2008	5	20	20	42.37	53.3	108.43	10	5.3
2008	5	21	22	22.56	-4.13	101.27	19	5.5
2008	5	23	19	35.47	7.31	-34.9	8	6.5
2008	5	24	4	58.88	42.39	-30.51	10	5.5
2008	5	24	13	21.98	-0.3	-18.81	10	5.1
2008	5	25	8	21.99	32.56	105.42	18	6.1
2008	5	27	8	3.27	32.7	105.53	10	5.2
2008	5	29	15	46.03	64	-21.01	9	6.3
2008	5	30	10	44.17	-54.74	0.99	10	5.7
2008	5	31	4	37.6	-41.2	80.48	9	6.4
2008	6	1	0	31.49	-54.82	0.98	10	5.5
2008	6	1	1	57.36	20.12	121.35	31	6.3
2008	6	3	3	9.93	32.07	104.6	10	5
2008	6	3	8	42.68	-3.44	68.31	10	5.3
2008	6	3	17	31.23	-8.17	120.25	14	5.9
2008	6	3	22	4.78	-8.1	120.23	14	6
2008	6	5	4	41.55	32.35	105	10	5.2
2008	6	6	20	2.68	35.88	-0.66	4	5.5
2008	6	8	12	25.97	37.96	21.52	16	6.4
2008	6	10	10	4.8	33.18	91.96	10	5.4
2008	6	10	11	4.48	33.18	92.08	10	5.1
2008	6	10	14	15.8	33.16	92.09	10	5.3
2008	6	11	12	30.41	-33.1	-15.86	10	5
2008	6	12	0	20.56	35.11	26.19	29	5.1
2008	6	12	5	19.74	-9.38	112.77	51	5.2
2008	6	13	16	13.46	0.82	97.48	23	5.1
2008	6	13	20	6.64	-17.84	-13.49	10	5.3
2008	6	16	10	17.1	-49.33	116.5	10	5
2008	6	18	8	12.82	33.21	92.02	44	5.2
2008	6	21	11	36.39	36.06	21.82	5	5.6
2008	6	24	18	26.3	40.04	70.84	48	5
2008	6	24	19	14.41	-3.18	101.43	49	5.1
2008	6	25	1	52.6	1.32	97.16	19	5.5
2008	6	27	11	40.39	11.01	91.82	17	6.6
2008	6	27	13	7.82	10.89	91.78	17	5.9
2008	6	28	15	29.15	10.9	91.93	20	5.4

2008	6	29	12	47.66	35.66	88.31	10	5.5
2008	6	30	6	17.3	-58.23	-22.1	8	7
2008	6	30	17	18.49	-58.15	-21.7	32	5.1
2008	7	1	1	54.13	-58.12	-21.88	10	5.6
2008	8	10	8	20.34	11.06	91.81	20	6.2
2008	8	10	9	27.74	11.02	91.76	29	5.3
2008	8	10	12	21.18	10.95	91.71	13	5.7
2008	8	10	13	1.15	10.98	91.79	10	5.3
2008	8	12	5	25.62	36.55	71.47	90	5
2008	8	12	21	3.14	31.87	104.23	10	5
2008	8	13	8	8.16	83.89	110.12	10	4.5
2008	8	13	18	30.72	83.55	114.52	10	5.7
2008	8	14	10	37.75	83.08	115.06	10	5.1
2008	8	14	17	16.02	8.08	-38.01	10	5
2008	8	15	3	38.74	-58.33	-22.87	10	5.2
2008	8	15	10	25.65	12.9	124.32	10	6
2008	8	16	7	25.69	5.72	61.21	10	5.4
2008	8	17	15	39.83	-52.87	-4.45	10	5.6
2008	8	17	20	46.56	12.97	124.3	10	5.4
2008	8	19	8	33.52	-8.2	-13.45	10	5.5
2008	8	20	13	18.52	12.95	124.32	35	5.3
2008	8	21	6	53.79	23.85	122.6	6	5
2008	8	21	12	20.87	24.86	97.82	37	4.9
2008	8	21	19	9.95	-58.57	-25.13	26	5
2008	8	22	7	21.26	-5.63	103.04	18	5.2
2008	8	23	7	45.85	44.4	-28.18	10	5
2008	8	25	3	19.5	8.08	59.09	10	4.8
2008	8	25	14	16.25	30.83	83.52	10	5.2
2008	8	25	19	13.25	30.63	83.29	10	5.1
2008	8	26	8	7.85	-52.53	26.42	10	4.9
2008	8	27	1	35.21	51.61	104.16	16	6.3
2008	8	28	2	59.91	-8.63	119.09	165	5
2008	8	29	9	43.51	30.73	83.39	10	4.9
2008	8	29	10	20.54	1.02	121.02	566	5.2
2008	8	30	0	43.52	3.7	63.45	10	4.8
2008	8	30	7	21.45	-56.19	-26.93	123	4.8
2008	8	30	12	4.23	13.01	124.32	50	5.2
2008	9	1	19	54.53	-57.92	-25.54	60	5.1
2008	9	2	0	6.93	-4.48	101.46	24	5
2008	9	2	9	0.32	0.49	98.09	35	5.1
2008	9	2	11	0.32	-8.28	120.57	190	5.1
2008	9	2	14	14.69	8.72	58.4	10	4.9

2008	9	3	6	27.54	24.87	97.78	10	5
2008	9	3	8	7.57	-3.69	100.02	35	4.8
2008	9	3	9	51.99	59.76	-29.83	10	4.6
2008	9	4	12	53.12	30.28	80.35	10	5
2008	9	4	18	47.53	30.1	-42.59	10	5.4
2008	9	5	4	57.25	36.54	71.29	230	5.4
2008	9	5	19	7.82	-1.17	-13.95	10	5.8
2008	9	6	5	47.99	36.49	70.93	191	5.8
2008	9	7	2	5.36	-23.71	69.49	10	5.4
2008	9	7	9	0.85	12.94	92.39	40	5
2008	9	7	14	7.57	-54.19	-56.01	37	4.9
2008	9	9	3	7.75	-3.93	103.06	25	5.2
2008	9	9	7	43.33	24.67	122.57	101	5.5
2008	9	10	0	18.33	2.45	96.29	39	5
2008	9	10	3	0.08	2.51	96.32	43	5.5
2008	9	10	4	2.74	2.42	96.3	37	4.8
2008	9	10	13	8.46	8.09	-38.71	9	6.6
2008	9	11	2	16.99	26.93	55.63	7	5.2
2008	9	16	6	32.7	36.59	71.05	250	4.8
2008	9	16	7	28.5	0.9	-29	10	5.8
2008	9	16	22	5.84	-10.33	120.22	37	4.8
2008	9	18	20	32.51	10.93	91.78	11	5
2008	9	19	21	17.51	-7.11	-13	10	5.1
2008	9	24	17	12.57	-22.71	-12.76	10	5.3
2008	9	25	1	47.11	30.84	83.49	4	6
2008	9	26	15	52.1	27.33	56.79	20	5.1
2008	9	27	3	4.17	13.47	120.57	10	5.7
2008	9	27	6	40.26	13.53	120.63	10	4.8
2008	9	28	19	52.58	71.41	-4.44	10	4.8
2008	9	28	22	20.11	71.32	-3.88	10	5.5
2008	9	29	19	16.64	71.34	-4.41	10	4.7
2008	10	3	21	20.37	10.76	91.66	19	5.6
2008	10	4	5	41.22	21.34	-45.73	10	5.3
2008	10	4	7	56.25	-59.34	-25.9	35	5.7
2008	10	5	16	5.08	39.36	73.86	35	4.6
2008	10	5	18	1.63	39.33	73.39	35	4.5
2008	10	6	10	17.1	29.81	90.42	10	5.1
2008	10	6	12	10.33	29.65	90.32	10	5.2
2008	10	8	14	7.62	29.76	90.33	9	5.5
2008	10	8	19	9.84	12.98	124.36	44	5.4
2008	10	9	20	20.45	-36.63	79.34	10	5.2
2008	10	11	9	6.07	43.37	46.25	16	5.8

2008	10	11	19	57.84	-5.61	110.12	532	5.2
2008	10	13	16	5.5	39.5	73.81	35	5.2
2008	10	13	17	16.99	38.56	70.34	10	5.2
2008	10	14	2	6.47	38.85	23.62	24	5.2
2008	10	14	19	51.53	4.03	68.84	10	5
2008	10	18	9	28.99	39.36	73.85	16	4.9
2008	10	18	18	41.21	-6.06	104.75	77	5.1
2008	10	19	2	56.41	-55.94	-28.19	161	5.1
2008	10	20	3	39.69	-60.54	-51.86	10	5.2
2008	10	20	4	54.92	0.11	120.68	96	5.9
2008	10	21	18	22.07	-11.32	116.28	8	4.8
2008	10	21	21	12.09	-10.38	-13.14	10	4.8
2008	10	21	23	4.64	0.07	-17.57	10	5.1
2008	10	24	14	10.45	29.08	51.27	20	4.9
2008	10	24	19	31.86	41.1	20.23	5	4.8
2008	10	26	1	28.6	36.49	70.68	210	5.7
2008	10	26	4	56.1	-5.53	-11.49	10	4.9
2008	10	26	10	27.74	-3.63	100.75	35	5.1
2008	10	26	21	12.62	-7.54	107.23	38	4.9
2008	10	27	15	37.75	13.45	120.51	48	4.8
2008	10	28	4	16.38	12.63	120.13	37	5
2008	10	28	22	33.85	30.56	67.44	10	5.3
2008	10	29	11	32.31	30.6	67.46	14	6.4
2008	11	4	12	43.37	32.06	104.48	10	4.9
2008	11	6	14	23.18	39.48	74.02	35	4.9
2008	11	10	1	22.25	37.56	95.83	19	6.3
2008	11	10	8	58.04	-0.25	100.14	126	5.1
2008	11	11	1	46.24	-4.15	102.19	65	5
2008	11	11	21	56.18	37.54	95.84	10	5.1
2008	11	11	22	46.83	0.02	67.09	10	5.1
2008	11	12	12	9.11	37.57	95.93	10	4.9
2008	11	12	14	3.83	38.84	35.52	10	5.1
2008	11	13	15	10.59	-55.96	-27.23	87	5.6
2008	11	14	2	5.99	-53.79	8.73	12	5.9
2008	11	14	20	17	19.16	121.23	14	4.8
2008	11	15	17	50.7	-57.2	-24.89	35	4.9
2008	11	15	22	59.04	32.14	104.75	10	5
2008	11	16	12	20.68	10.83	91.71	26	5.5
2008	11	16	17	2.27	1.27	122.09	30	7.4
2008	11	16	18	20.24	1.13	121.78	35	5.5
2008	11	16	22	33.99	1.36	122.25	30	4.9
2008	11	19	17	14.02	8.66	93.64	44	5.2

2008	11	21	6	58.12	-55.62	-26.22	59	5
2008	11	22	18	49.23	-1.23	-13.93	10	6.3
2008	11	22	22	5.94	-4.61	101.22	35	5.1
2008	11	23	10	19.3	31.18	103.83	10	4.8
2008	11	25	1	19.75	-46.78	-10.72	10	5.4
2008	11	27	9	17.81	-41.61	85.1	10	5.3
2008	11	28	11	3.49	13.39	120.56	67	5
2008	11	29	11	43.17	35.97	69.26	10	4.9
2008	11	30	14	28.16	-59.55	-26.42	69	4.8
2008	12	1	10	18.01	35.3	46.54	27	5
2008	12	2	5	11.2	27.37	88.05	24	5.2
2008	12	3	4	26.87	42.72	73.23	6	4.9
2008	12	3	21	15.04	-6.4	-11.13	10	4.9
2008	12	4	13	57.15	31.19	103.35	10	4.8
2008	12	5	23	33.56	8.71	93.97	41	4.6
2008	12	6	0	43.87	8.72	93.98	38	5.3
2008	12	6	9	24.85	43.96	86.02	69	5
2008	12	6	10	24.64	37.6	95.76	10	4.9
2008	12	6	15	22.79	-7.76	117.81	35	4.8
2008	12	7	6	23.99	13.35	-44.83	10	5.6
2008	12	7	13	36.13	26.99	55.8	15	5.4
2008	12	7	21	18.67	23.84	122.17	12	5.2
2008	12	8	1	51.1	13.41	-44.79	10	5.5
2008	12	8	8	59.13	29.95	82.05	35	5.3
2008	12	8	14	41.33	26.92	55.85	6	5.1
2008	12	8	18	39.94	-53.01	106.82	11	6.3
2008	12	9	2	46.27	30.34	67.56	10	5.2
2008	12	9	5	53.3	30.39	67.45	10	5.3
2008	12	9	12	57.8	30.31	67.64	10	5.2
2008	12	9	15	9.39	26.8	55.68	14	5
2008	12	9	18	53.11	32.52	105.39	24	5.1
2008	12	9	21	0.24	7.66	92.22	43	5.1
2008	12	9	22	52.76	30.44	67.4	10	5.7
2008	12	11	12	31.54	35.31	81.41	10	5
2008	12	11	17	6.68	-3.65	100.75	14	5.7
2008	12	11	20	55.41	-5.84	105.33	35	5.2
2008	12	13	8	45.63	-48.98	123.4	10	5.9
2008	12	13	17	21.43	8.01	-38.02	10	5
2008	12	14	5	13.75	-58.85	-26.06	79	5
2008	12	14	20	36.98	-60.08	-18.76	10	5.5
2008	12	15	21	18.01	-2.83	101.04	48	5.3
2008	12	16	10	19	-16.29	67.12	10	5.2

2008	12	17	16	6.81	-6.07	103.51	35	5.2
2008	12	17	21	57.48	39.21	15.44	257	5.3
2008	12	19	8	31.15	47.01	-27.29	5	5.9
2008	12	20	21	5.62	-31.19	-13.34	4	5.8
2008	12	20	22	13.8	-31.12	-13.42	10	5.4
2008	12	21	13	47.23	4.83	95.04	56	5.4
2008	12	21	22	38.99	35.96	71.41	74	5
2008	12	23	21	58.5	44.52	10.39	31	5
2008	12	25	22	40.36	23.42	64.5	13	5.8
2008	12	28	22	58.9	40.39	25.78	35	5.2
2008	12	29	3	37.1	36.39	71.07	151	5.8
2008	12	29	6	18.26	32.28	105.1	10	5
2008	12	29	12	11.54	-1.19	67.56	10	5.2
2008	12	30	18	9.47	-10.25	118.46	49	5.2
2008	12	30	19	49.26	-4.3	101.22	20	5.9
2008	12	30	20	32.8	-4.37	101.19	10	5.1
2009	1	1	10	35.42	1.32	121.84	33	5.1
2009	1	1	16	57.31	-4.33	101.3	19	5.5
2009	1	1	18	37.41	-4.33	101.24	26	5.3
2009	1	2	19	42.71	0.62	-26.66	10	5.6
2009	1	2	20	14.06	0.79	-27.12	10	5.5
2009	1	3	20	23.01	36.42	70.74	204	6.6
2009	1	4	20	22.47	6.45	94.17	35	5.3
2009	1	4	23	12.92	36.44	70.88	186	5.7
2009	1	5	16	54.33	-3.53	100.72	27	5.2
2009	1	7	4	43.5	-9.11	123.85	54	5
2009	1	8	11	40.35	1.88	96.72	10	5
2009	1	8	12	4.57	41.8	20.83	17	4.9
2009	1	9	3	44.88	10.44	56.96	10	5.7
2009	1	9	6	54.5	-2.23	99.76	16	5.1
2009	1	9	7	28.61	16.09	119.74	65	5
2009	1	11	19	50.63	-1.59	99.73	35	5
2009	1	12	2	0.83	13.5	120.82	37	5.2
2009	1	12	22	14.02	2.82	95.78	58	5.1
2009	1	13	1	4.26	-13.15	66.08	10	6
2009	1	13	6	12.29	35.66	26.39	42	5.3
2009	1	14	11	9.8	-7.75	118.69	38	5
2009	1	16	22	13.96	14.49	-45.06	10	5.4
2009	1	17	5	17.35	-59.74	-26.7	77	5.1
2009	1	20	4	6.72	0.47	120.99	88	5.1
2009	1	20	12	34.4	-10.69	115.03	30	5.1
2009	1	21	6	27.74	-20.17	66.41	10	5.2

2009	1	23	12	38.37	21.12	121.24	10	5.3
2009	1	23	13	18.97	-5.13	68.56	10	5
2009	1	24	0	36.44	0.11	97.03	35	4.9
2009	1	25	1	47.71	43.24	80.89	19	5.1
2009	1	26	19	33.47	-0.35	98.18	10	5.7
2009	1	26	21	30.87	57.51	120.58	13	5.4
2009	1	27	0	57.59	-11.38	117.55	12	5.1
2009	1	28	0	1.45	-0.26	98.28	20	5.7
2009	1	28	7	53.81	-8.94	124.16	65	5.7
2009	1	28	20	29.68	13.73	92.82	35	5.1
2009	1	29	4	45.55	-9.01	124.11	65	5
2009	1	29	22	43.51	10.97	124.96	8	5.4
2009	2	2	8	36.1	27.23	66.32	35	5.1
2009	2	2	9	4.41	-4.55	102.76	50	5
2009	2	5	10	40.47	-56.55	-25.51	35	5
2009	2	6	9	59.5	-6.94	123.24	658	5
2009	2	9	10	47.94	1.32	123.47	23	5.4
2009	2	11	4	17.12	-0.08	124.29	62	5
2009	2	11	17	34.04	3.89	126.39	20	7.2
2009	2	11	19	0.97	3.88	126.33	35	4.8
2009	2	11	19	1.54	3.83	126.48	35	5.5
2009	2	12	3	1.54	3.81	126.57	35	5.1
2009	2	12	3	49.96	3.95	126.41	26	6
2009	2	12	8	30.72	3.97	126.72	35	6
2009	2	12	14	7.88	4	126.57	35	5
2009	2	12	14	16.88	3.69	126.51	35	5.3
2009	2	12	15	32.79	4.02	126.76	35	4.9
2009	2	12	17	17.04	3.6	126.75	35	4.8
2009	2	12	17	46.53	3.98	126.48	43	5.7
2009	2	12	20	25.51	-8.24	121.37	221	5.4
2009	2	13	21	26.66	3.78	126.46	32	5.4
2009	2	13	23	32.24	46.75	84.5	10	5
2009	2	18	0	9.88	-52.96	20.89	10	5.1
2009	2	18	3	7.03	-52.97	20.91	10	5.9
2009	2	20	3	48.85	34.2	73.9	12	5.5
2009	2	20	10	2.91	40.66	78.69	17	5.3
2009	2	21	16	53.43	55.45	-35.07	10	5.4
2009	2	23	5	56.16	0.48	98.55	35	5.4
2009	2	23	11	10.68	27.58	55.37	10	5.1
2009	2	24	0	46.04	-0.25	-18.32	10	5.2
2009	2	24	1	26.66	-27.05	75.14	10	5.1
2009	2	24	10	35.96	-1.74	120.54	35	5.1

2009	2	25	16	8.01	-41.89	88.63	10	5.5
2009	2	26	12	32.24	19.02	121.26	38	5.5
2009	2	27	5	25.84	1.52	97.09	35	5.1
2009	2	28	10	50.2	3.83	126.48	35	5.3
2009	2	28	14	33.63	-60.53	-24.8	15	6.3
2009	3	2	0	3.97	-1.11	119.87	11	5.6
2009	3	3	6	5.35	-56.35	-27.06	134	5.3
2009	3	3	14	22.02	38.07	71.59	2	5.1
2009	3	3	16	21.86	31.8	104.79	10	5.1
2009	3	3	21	59.16	1.71	126.47	41	4.9
2009	3	4	10	56.37	2.8	95.44	26	5.2
2009	3	5	12	17.62	80.21	-1.09	10	5.4
2009	3	5	15	49.27	15.58	95.99	7	5.1
2009	3	5	19	41.07	80.28	-1.83	10	5.5
2009	3	6	10	50.94	80.32	-1.85	9	6.5
2009	3	7	0	36.45	-9.33	124.85	33	5
2009	3	7	16	27	-8.35	123.59	172	5.3
2009	3	9	9	47.87	-16.6	-11.08	10	4.9
2009	3	11	12	58.32	10.67	91.69	10	5.1
2009	3	12	5	18.83	-60.86	-23.81	10	5.5
2009	3	12	8	25.8	32.39	105.1	10	5.3
2009	3	12	10	5.85	4.67	95.05	35	5
2009	3	12	11	47.58	-52.93	27.2	10	5.2
2009	3	14	13	26.3	30.15	68.47	35	5
2009	3	17	23	14.71	25.91	67.24	27	5
2009	3	20	16	1.44	-58.69	-24.84	26	5.4
2009	3	21	23	22.99	-14.51	66.1	10	5
2009	3	22	5	52.84	-12.93	-14.59	10	5.1
2009	3	22	12	54.13	-12.74	-14.69	10	5
2009	3	23	4	28.17	9.8	57.82	10	5.5
2009	3	23	14	58.23	5.36	94.38	50	5.1
2009	3	24	4	35.58	5.26	94.31	58	5
2009	3	24	12	34.43	14.47	-45.06	10	5.2
2009	3	26	6	14.21	-27.46	73.3	10	5.7
2009	3	26	18	43.75	-6.78	-12.54	10	5.4
2009	3	26	19	13.64	-6.86	-12.42	10	5.1
2009	3	27	10	0.71	-12.8	-14.55	10	5
2009	4	1	2	34.66	33.66	82.44	10	5
2009	4	1	6	29.03	-5.96	101.91	35	5.6
2009	4	1	14	27.66	-3.51	100.63	26	5.3
2009	4	3	9	11.82	-59.55	-26.25	35	5.2
2009	4	4	18	39.71	-55.98	-27.73	87	5.5

2009	4	5	12	56.45	-5.26	68.55	10	5.6
2009	4	5	19	45.7	-9.27	124.16	10	5.1
2009	4	6	1	32.9	42.33	13.33	8	6.3
2009	4	7	15	18.19	37.66	-17.39	10	5
2009	4	7	17	47.7	42.28	13.46	15	5.5
2009	4	8	6	26.46	-58.1	-6.26	10	5.6
2009	4	8	8	22.83	8.06	-37.95	10	5.2
2009	4	9	0	52.9	42.48	13.34	15	5.4
2009	4	9	1	46.82	27.14	70.75	44	5.1
2009	4	9	3	31.81	-60.55	-49.82	10	5.1
2009	4	9	8	10.4	6.26	94.44	82	5.1
2009	4	9	19	38.73	42.51	13.33	2	5.2
2009	4	10	6	51.74	-18.47	65.94	10	5.2
2009	4	11	1	59.85	1.18	97.29	42	4.9
2009	4	11	17	14.67	-59.6	-26.27	68	5.2
2009	4	12	5	19.91	1.98	122.12	56	5.2
2009	4	13	13	36.63	-6.82	125.09	554	5.6
2009	4	15	10	20.46	12.35	58.07	10	5.7
2009	4	15	14	7.99	-18.49	65.95	10	5.2
2009	4	15	17	47.77	-3.08	100.42	19	5.7
2009	4	15	20	1.46	-3.12	100.47	22	6.3
2009	4	16	5	17.94	-12.45	65.21	10	5.2
2009	4	16	14	57.62	-60.2	-26.86	20	6.7
2009	4	16	20	42.05	-3.24	100.41	22	4.9
2009	4	16	20	51.63	-3.22	100.46	41	5
2009	4	16	21	27.13	34.19	70.08	5	5.2
2009	4	17	15	35.67	-49.52	125.93	10	5.3
2009	4	19	4	8.09	41.28	78.2	39	5.4
2009	4	19	8	18.74	53.51	-35.28	10	4.8
2009	4	19	11	10.02	2.8	99.09	174	5.1
2009	4	20	19	12.07	15.39	120.24	50	5.2
2009	4	21	19	41.68	14.26	56.27	10	4.9
2009	4	21	19	45.37	14.43	56.28	10	5.3
2009	4	25	17	18.86	45.65	26.61	100	5.2
2009	4	26	23	54.25	40.93	72.89	27	4.9
2009	4	27	20	4.46	42.84	72.43	18	5
2009	4	28	19	54.5	52.67	-35.03	10	5.6
2009	4	29	18	53.32	41.61	71.43	34	4.8
2009	4	30	10	4.68	27.74	61.42	69	5.2
2009	5	5	2	40.03	-43.52	-16.12	10	5
2009	5	5	6	16.73	-58.7	-25.11	36	5.1
2009	5	5	9	5.88	-56.34	-26.58	10	5.1

2009	5	7	22	44.43	25.45	57.03	38	5
2009	5	8	13	19.11	3.36	97.65	24	5.2
2009	5	10	8	58.43	-5.44	101.14	31	5.2
2009	5	10	17	34.76	38.23	67.69	19	5
2009	5	11	14	32.03	-30.05	-13.9	10	5.2
2009	5	12	12	38.08	-12.43	65.14	10	5.8
2009	5	13	23	2.56	-55.87	-26.92	44	5.4
2009	5	17	19	24.01	82.52	-8.63	6	5.5
2009	5	18	10	9.73	-4.26	101.24	35	5
2009	5	19	3	26.33	-47.35	-13.37	10	4.9
2009	5	19	7	4.65	-7.11	67.86	10	5
2009	5	19	16	54.1	25.25	37.7	10	5
2009	5	19	17	35.1	25.29	37.74	5	5.7
2009	5	20	9	57.24	-7.14	67.97	10	5.3
2009	5	21	12	33.56	36.27	77.54	99	5.1
2009	5	24	1	6.86	14.85	119.8	58	5.4
2009	5	24	6	49.33	-42.08	88.35	10	5.6
2009	5	29	19	12.24	0.96	126.11	35	5.3
2009	5	30	6	47.4	-60.42	-26.11	10	5.5
2009	5	31	3	34.89	1.79	125.91	90	4.8
2009	6	2	14	39.52	40.28	53.01	52	5
2009	6	3	4	36.26	-37.94	49.28	10	5.2
2009	6	3	18	54.83	-50.01	120.59	3	5.7
2009	6	4	2	54.81	32.78	81.75	7	5
2009	6	4	17	25.55	-45.83	35.14	16	6
2009	6	4	23	59.97	-0.33	125.11	72	5
2009	6	5	18	8.51	-9.17	123.73	56	5
2009	6	6	15	37.75	-47.88	99.67	10	5.4
2009	6	6	20	33.88	23.86	-46.1	14	6
2009	6	7	5	25.56	-8.44	118.39	146	5.2
2009	6	7	17	48.92	-36.7	-20.07	10	5.2
2009	6	9	5	38.3	10.82	91.72	35	5.2
2009	6	9	15	15.67	-56.27	-26.72	101	5
2009	6	10	18	51.79	55.42	111.06	10	5
2009	6	11	0	15.63	-4.89	102.9	22	5.3
2009	6	11	8	55.36	-24.97	-13.62	10	5.3
2009	6	13	17	17.82	44.72	78.86	14	5.4
2009	6	14	3	36	-7.69	117.2	17	5.5
2009	6	14	5	58.32	5.36	126.44	35	6.1
2009	6	14	20	25.79	-58.97	-24.98	30	5.1
2009	6	14	21	8.67	5.38	126.42	61	5.3
2009	6	14	22	10.49	-56.12	-27.62	35	5

2009	6	15	3	41.12	-59.41	-26.26	81	5
2009	6	15	12	5.67	9.05	93.62	42	5.2
2009	6	16	17	52.3	-4.04	126.35	39	5
2009	6	16	20	5.69	-54.37	5.87	10	6.1
2009	6	18	4	26.47	35.38	28.41	39	5
2009	6	19	14	4.9	35.36	28.45	28	5.8
2009	6	20	9	21.38	-4.99	103.05	46	5.4
2009	6	21	12	27.61	76.28	7.16	10	5.4
2009	6	22	18	15.99	76.22	6.79	10	5.4
2009	6	22	19	5.72	76.23	7	10	5.1
2009	6	24	11	12.19	0.17	-16.88	10	5.3
2009	6	24	21	9.13	23.85	122.41	18	4.9
2009	6	25	9	15.64	-1.2	98.79	44	5
2009	6	25	12	34.78	-23.81	-13.43	10	5.3
2009	6	27	6	33.88	19.09	121.11	10	5
2009	6	27	15	45.91	-33.2	-15.94	13	5.6
2009	6	28	0	4.24	-31.76	58.38	10	5
2009	6	28	14	18.44	1.34	122.29	35	5
2009	6	28	14	19	1.38	122.2	36	5.7
2009	6	29	18	3.07	31.43	104.01	10	5.3
2009	6	30	6	56.66	-16.84	-14.4	10	5.1
2009	7	1	0	29.71	39.59	73.45	39	5
2009	7	1	9	30.04	34.16	25.47	19	6.4
2009	7	1	18	58.14	0.3	96.71	35	5
2009	7	1	21	10.44	1.05	125.96	37	5.8
2009	7	2	3	20.91	-11.63	-14.16	10	5.4
2009	7	2	11	29.16	4.6	124.57	42	5.2
2009	7	3	20	28.5	-49.75	-8.05	10	5.3
2009	7	4	0	41.81	13.64	120.74	127	5.2
2009	7	7	16	31.1	-26.74	67.48	10	5.7
2009	7	9	11	19.62	25.63	101.1	7	5.7
2009	7	10	3	48.67	0.25	123.29	253	5.3
2009	7	10	9	2.37	25.67	101.03	10	5.2
2009	7	10	16	50.11	-0.32	98.25	46	5
2009	7	11	15	19	9.93	122.14	14	5.1
2009	7	13	10	52.99	-9.14	119.32	65	5.9
2009	7	13	10	52.02	-9.13	119.32	67	5.9
2009	7	13	18	5.14	24.06	122.2	17	6.3
2009	7	13	20	28.49	24.09	122.12	37	5
2009	7	16	4	44.06	38.87	101.31	15	5.1
2009	7	16	10	48.66	24.1	122.21	43	5.4
2009	7	16	15	5.35	3.34	-31.51	10	5.2

2009	7	16	18	42.96	24.06	122.23	37	5.2
2009	7	18	17	6.52	0.85	-29.32	10	5.1
2009	7	18	20	32.99	35.89	43.35	25	5.1
2009	7	18	22	19.99	-55.68	-27.92	71	5
2009	7	19	11	39.85	-8.96	95.5	21	5.1
2009	7	20	3	37.63	-8.85	117.79	30	5.2
2009	7	21	19	55.5	-13.67	66.11	10	5.2
2009	7	22	3	53.3	26.77	55.79	9	5.5
2009	7	23	14	3.84	-56.29	-27.05	143	5.2
2009	7	24	3	11.68	31.16	85.9	13	5.8
2009	7	25	18	41.8	1.87	97.02	39	5.2
2009	7	26	6	10.81	23.43	121.51	7	5
2009	7	26	13	29.59	10.69	94.31	10	5.1
2009	7	26	15	26.75	10.76	94.29	10	5
2009	7	26	21	49.16	10.61	94.19	10	5
2009	7	26	23	10.35	-4.81	102.89	40	5.7
2009	7	27	6	23.16	34.9	73.22	49	5
2009	7	28	5	14.75	10.59	94.12	10	5.2
2009	7	28	8	43.44	-5.5	101.7	10	5.6
2009	7	28	12	50.29	-8.68	112.51	79	5.2
2009	7	29	16	53.38	21.98	120.45	11	5.4
2009	7	31	0	5.71	-9.96	118.75	18	5.1
2009	7	31	14	56.64	-8.8	108.74	17	5.4
2009	8	1	22	0.04	-9.19	123.18	113	5.3
2009	8	4	16	20.82	50.65	96.87	10	5.3
2009	8	5	6	28.18	-8.76	67.5	10	5.2
2009	8	10	19	55.56	14.1	92.89	4	7.5
2009	8	11	21	43.75	24.32	94.79	99	5.5
2009	8	12	14	50.42	-57.66	-25.25	28	5.5
2009	8	12	20	4.5	6.04	126.38	95	5.7
2009	8	13	9	21.57	14.05	92.82	35	5.9
2009	8	14	19	39.99	13.96	93.02	25	5
2009	8	14	20	56.92	13.38	125.37	18	5.4
2009	8	15	12	30.24	0.1	123.41	160	5.3
2009	8	16	7	38.17	-1.48	99.49	20	6.7
2009	8	16	10	21.6	-1.47	99.47	33	4.9
2009	8	16	10	45.62	-1.55	99.42	10	5.4
2009	8	16	12	49	-1.45	99.43	21	5.8
2009	8	16	20	0.71	-1.39	99.48	10	4.8
2009	8	16	20	23.46	-1.38	99.55	30	5
2009	8	17	0	5.9	23.5	123.5	20	6.7
2009	8	17	10	10.65	23.43	123.52	15	6.1

2009	8	17	13	55.74	-1.44	99.45	10	5
2009	8	18	9	28.69	-1.45	99.42	26	4.9
2009	8	18	13	17.52	23.51	123.51	5	5.4
2009	8	18	16	26.88	-0.96	97.96	19	5.1
2009	8	18	17	50.4	-0.91	97.95	10	5.9
2009	8	18	23	47.44	23.42	123.43	4	4.8
2009	8	19	2	55.81	-1.37	99.37	10	5.5
2009	8	19	10	45.38	26.56	92.47	10	5
2009	8	19	11	35.09	-1.42	99.48	10	5
2009	8	20	6	35.44	72.2	0.94	6	6
2009	8	20	14	18.2	23.47	123.43	29	5.2
2009	8	21	20	57.44	22.27	120.52	30	5.1
2009	8	22	12	34.04	0.91	-28.54	10	5.3
2009	8	23	7	20.7	0.27	96.97	35	5.4
2009	8	23	8	25.54	20.08	121.5	35	5.2
2009	8	23	17	38.38	-1.65	99.57	18	5.4
2009	8	26	22	20.29	9.38	124.02	571	5.3
2009	8	26	23	27.33	0.13	123.52	141	5.2
2009	8	28	1	51.04	-7.15	123.43	642	6.9
2009	8	28	2	14.61	37.65	95.71	4	5.6
2009	8	28	16	28.12	37.69	95.78	10	5
2009	8	29	4	13.41	-0.94	97.97	35	5
2009	8	29	13	59.6	12.92	57.6	10	5.3
2009	8	29	18	43.18	37.64	95.72	10	5.2
2009	8	30	17	15.08	37.67	95.65	10	5.4
2009	8	30	19	27.88	25.28	95.1	82	5.3
2009	8	31	10	15.97	37.61	95.83	6	5.8
2009	8	31	10	15.04	37.62	95.84	10	5.7
2009	8	31	21	51.76	37.64	95.89	10	5.3
2009	8	31	22	27.17	37.69	95.94	10	4.8
2009	9	1	0	16.5	37.68	95.88	10	5
2009	9	2	7	55.1	-7.78	107.3	46	7
2009	9	2	8	2.12	-7.82	107.39	51	5.5
2009	9	3	19	51.8	24.33	94.68	104	5.9
2009	9	4	22	16.75	-48.3	31.67	10	5.3
2009	9	6	21	49.21	41.48	20.39	3	5.5
2009	9	7	16	12.25	-10.2	110.63	23	6.2
2009	9	7	22	41.73	42.66	43.44	15	6
2009	9	8	3	39.26	5.26	94.32	57	5
2009	9	8	15	18.67	-7.78	117.37	268	5.2
2009	9	8	18	51.28	1.12	120.9	22	5.8
2009	9	9	4	2.42	-5.43	103.63	71	5

2009	9	9	8	6.33	2.41	126.01	106	5.7
2009	9	10	0	20.21	37.65	95.91	10	5.2
2009	9	17	9	24.95	37.64	95.94	10	5.1
2009	9	18	6	23.34	12.62	120.43	12	5.9
2009	9	18	7	2.2	37.65	95.6	6	5.1
2009	9	18	11	53.8	6.51	124.71	10	5.7
2009	9	18	23	6.77	-9.14	115.59	79	5.7
2009	9	19	4	17.68	36.48	70.74	199	5.1
2009	9	19	8	54.68	32.84	105.52	14	4.9
2009	9	20	22	7.77	8.24	-39.07	10	5
2009	9	21	8	30.39	71.04	-7.67	10	5.6
2009	9	21	9	43.09	30.88	79.06	52	5
2009	9	21	19	38.23	20.4	94.79	84	5.7
2009	9	22	19	25.11	12.47	120.5	10	5.1
2009	9	23	7	29.45	-60.31	-33.19	10	5.4
2009	9	26	4	22.75	-29.56	60.85	10	5.2
2009	9	27	15	16.24	2.68	125.74	106	5.4
2009	9	30	10	16.92	-0.72	99.87	81	7.6
2009	10	1	1	52.73	-2.52	101.5	9	6.6
2009	10	1	2	20.09	-2.41	101.42	10	5.3
2009	10	2	13	49.03	39.49	96.07	10	5
2009	10	2	15	53.72	-0.82	121.73	53	5.2
2009	10	3	17	36.61	23.63	121.45	28	6.1
2009	10	4	10	58.01	6.74	123.38	620	6.6
2009	10	4	11	4.79	6.68	123.53	640	5.6
2009	10	4	21	50.23	31.87	49.49	9	5.1
2009	10	6	0	16.45	46.5	-27.3	10	4.9
2009	10	7	21	41.32	4.08	122.37	574	6.8
2009	10	8	19	9.86	-4.88	-11.59	10	5.1
2009	10	10	9	1.11	3.87	122.39	602	5.1
2009	10	12	3	15.72	-17.1	66.69	10	6.2
2009	10	12	15	1.21	37.62	-31.94	10	5.1
2009	10	13	12	47.04	38.79	70.7	35	5
2009	10	15	13	27.83	36.99	71.38	94	5
2009	10	15	18	33.66	-3.62	123.16	17	5.7
2009	10	16	9	52.08	-6.53	105.22	38	6.1
2009	10	16	10	1.81	-6.45	105.18	35	5.2
2009	10	18	8	23.58	-3.65	123.2	20	5.6
2009	10	18	14	14.44	-2.96	68.06	10	5.2
2009	10	18	17	21.86	-7.54	126.04	30	5
2009	10	18	23	50.05	13.7	120.65	155	5.7
2009	10	19	22	18.64	-6.86	123.98	605	5.4

2009	10	22	19	51.75	36.52	70.95	185	6.2
2009	10	23	11	37.41	-12.39	65.21	10	5.4
2009	10	24	20	54.08	-9.9	118.79	35	5.6
2009	10	24	21	4.77	-10.04	118.68	17	5
2009	10	25	17	47.93	29.57	63.88	125	5.6
2009	10	27	0	4.62	-59.96	-65.16	10	6
2009	10	27	11	27.77	-56.09	-27.64	140	5
2009	10	29	5	21.04	1.26	126.2	55	5.2
2009	10	29	13	28.15	32.52	105.24	14	5.2
2009	10	29	17	44.2	36.39	70.72	210	6.2
2009	10	29	21	5.99	8.15	91.76	29	5
2009	10	30	6	43.38	34.18	70.02	30	5.1
2009	10	31	22	50.36	-5	102.98	67	5
2009	11	1	21	7.06	25.96	100.82	24	4.9
2009	11	2	21	35.43	14.03	92.97	15	5.4
2009	11	3	5	25.81	37.5	20.49	10	5.8
2009	11	3	11	30.65	-56.93	-24.93	12	5.4
2009	11	3	23	26.2	27.33	56.2	14	5
2009	11	4	18	41.43	36.15	-33.87	10	5.9
2009	11	4	21	56.86	37.65	95.76	3	5.1
2009	11	5	9	32.65	23.73	120.74	18	5.6
2009	11	5	11	34.88	23.66	120.84	10	5.5
2009	11	6	3	27.08	-1.39	69.4	10	4.9
2009	11	7	20	8.62	29.49	86.01	5	5.5
2009	11	8	19	41.33	-8.21	118.63	18	6.6
2009	11	8	20	35.14	6.7	60.26	10	5.6
2009	11	9	0	21.89	-43.46	39.61	10	5.5
2009	11	10	2	48.67	8.08	91.9	23	6
2009	11	11	9	51.65	37.51	20.36	10	5.3
2009	11	11	13	48.92	9.36	125.53	23	5.7
2009	11	12	4	6.56	0.35	98.42	52	5
2009	11	12	19	39.63	-4.73	103.12	69	5.4
2009	11	14	0	51.32	-38.49	-15.65	10	5.1
2009	11	14	22	2.55	5.9	61.22	10	5.3
2009	11	15	13	10.84	53.85	-35.18	10	5.4
2009	11	18	1	42.77	-53.97	6.48	10	5.5
2009	11	18	2	17.05	-9.29	107.51	40	5.4
2009	11	19	0	5.45	-46.06	34.93	10	5
2009	11	20	7	16.89	30.76	83.45	19	5
2009	11	20	19	31.61	-0.18	-18	5	5.5
2009	11	26	6	13.27	13.63	92.78	39	5.1
2009	11	26	15	9.67	36.09	21.4	28	5

2009	11	27	16	4.53	31.19	103.79	20	4.9
2009	11	28	0	4.69	-10.44	118.85	35	5.1
2009	11	28	5	39.75	24.39	123.47	32	4.4
2009	11	28	6	4.33	-10.41	118.9	22	6
2009	11	28	18	10.06	5.33	126.29	38	6.1
2009	11	29	2	28.31	5.4	126.38	35	5.4
2009	11	29	20	9.91	5.34	126.25	35	5.7
2009	11	30	2	54.82	-2.42	-11.76	10	5.1
2009	12	1	11	40.56	13.62	92.79	33	5.4
2009	12	2	4	20.65	-20.52	64.52	10	5.3
2009	12	2	20	27.21	12.19	125.55	14	5.5
2009	12	2	23	14.08	-56.16	-26.77	59	5.4
2009	12	3	6	28.87	-32.23	78.96	10	5.3
2009	12	3	23	6.67	-2.71	68.04	10	5.4
2009	12	4	0	41.07	-29.44	77.66	10	5
2009	12	4	6	2.9	37.92	28.73	5	4.9
2009	12	5	16	43.91	0.48	126.17	43	5.1
2009	12	6	4	33.68	35.78	77.35	72	5.3
2009	12	6	6	44.08	-7.89	118.94	10	5
2009	12	7	22	6.6	0.12	97.11	27	4.9
2009	12	8	0	11.61	-4.8	103.11	73	5
2009	12	9	16	0.33	-0.64	-21.07	10	6.4
2009	12	9	21	29.25	2.77	95.91	19	6
2009	12	10	15	6.44	6.69	126.27	65	5.3
2009	12	12	11	51.57	17.11	73.77	10	5.1
2009	12	12	16	22.08	28.45	66.62	32	4.8
2009	12	13	14	41.58	22	91.82	10	5.4
2009	12	13	16	4.06	41.72	94.32	10	5.4
2009	12	14	3	5.43	-10.03	123.66	45	5.5
2009	12	14	18	45.72	-55.47	-26.86	10	5
2009	12	16	3	40.37	-55.49	-26.9	10	5.5
2009	12	17	1	37.8	36.46	-9.9	19	5.6
2009	12	17	4	41.48	3.1	125.62	145	5
2009	12	17	14	55.62	42.45	-30.57	4	5.4
2009	12	17	22	57.58	-55.48	-26.91	10	5.1
2009	12	19	13	2.7	23.8	121.61	57	6.4
2009	12	20	13	25.8	-0.18	124.48	56	5
2009	12	21	5	15.88	37.53	96.64	10	5.4
2009	12	21	12	26.4	0.46	125.41	75	5.1
2009	12	21	19	59.21	17.28	121.49	10	5.5
2009	12	22	6	6.34	35.72	31.51	63	5.3
2009	12	23	1	11.82	-1.43	99.39	19	6

2009	12	24	22	4.16	-55.44	-26.74	10	5.2
2009	12	26	0	23.85	14	92.86	42	5
2009	12	26	5	9.8	6.48	126.37	59	5.3
2009	12	28	15	0.35	-10.13	124.64	10	5.2
2009	12	29	9	1.53	24.36	94.81	124	5.7
2009	12	30	5	40.14	-8.31	126.89	35	5.1
2009	12	30	7	48.75	10.6	125.3	152	5.3
2009	12	30	11	17.98	6.52	126.34	34	5.6
2009	12	31	9	57.97	27.32	91.51	10	5.5
2009	12	31	12	22.96	19.41	122.77	47	5
2010	1	1	2	8.19	26.29	99.87	10	5
2010	1	2	2	15.2	38.24	71.47	47	5.4
2010	1	5	4	55.89	-58.17	-14.7	10	6.8
2010	1	5	14	36.69	-2.44	121.31	38	5
2010	1	6	16	38.59	-41.6	-16.57	10	5.6
2010	1	10	0	25.42	-7.91	107.88	65	5.1
2010	1	10	8	9.5	-0.02	123.17	176	5.2
2010	1	13	12	42.81	6.61	124.4	10	5.2
2010	1	15	0	6.95	7.17	125.94	48	5.3
2010	1	16	20	23.7	32.45	48.3	5	5
2010	1	17	12	0.1	-57.66	-65.88	5	6.3
2010	1	18	11	46.92	-48.29	106.6	10	5.2
2010	1	20	19	7.87	-57.77	-65.81	10	5.3
2010	1	21	17	0.11	1.45	122.2	32	5.1
2010	1	22	0	46.67	38.42	22.04	5	5.2
2010	1	22	6	46.72	3.03	93.79	36	5.1
2010	1	24	1	2.92	-31.91	57.92	10	5.3
2010	1	24	2	36.56	35.51	110.74	28	5
2010	1	25	15	55.33	-4.26	102.69	61	5.2
2010	1	26	6	53.59	-0.32	99.09	63	5.2
2010	1	26	15	22.62	-39.26	-15.9	10	5.7
2010	1	27	11	20.65	-38.65	-15.93	10	5
2010	1	27	12	31.59	-38.9	-15.83	10	5.4
2010	1	27	17	42.51	-14.1	-14.55	10	5.8
2010	1	27	19	0.3	-7.16	125.03	530	5.1
2010	1	30	21	36.8	30.27	105.67	10	5.1
2010	1	31	7	2.62	-2.88	100.91	50	5.3
2010	2	3	2	18.3	-58.9	-25.81	92	5.1
2010	2	5	6	59.55	-47.91	99.59	1	6.2
2010	2	8	12	8.11	-56.19	-24.57	35	5.1
2010	2	9	5	2.24	20.99	121.13	24	5
2010	2	10	6	33.42	-9.26	111.03	35	5

2010	2	10	20	46.48	1.04	126.24	42	5.5
2010	2	11	9	18.08	-39.15	81.98	10	5.3
2010	2	11	18	43.97	-9.9	113.85	51	5.8
2010	2	11	21	56.15	34	25.39	14	5.4
2010	2	12	2	42.85	23.84	121.19	21	5.2
2010	2	12	11	20.92	29.74	-42.73	10	5.1
2010	2	15	10	15.42	6.17	126.91	102	5.4
2010	2	15	21	51.77	-7.22	128.72	126	6.2
2010	2	16	6	48.42	19.04	121.15	10	5.2
2010	2	16	19	8.41	4.62	93.14	34	5.2
2010	2	21	9	42.36	-27.52	65.97	10	5
2010	2	22	5	21.49	24.13	122.94	29	5.5
2010	2	23	10	25.68	32.51	48.29	35	5.2
2010	2	25	4	56.19	25.52	101.9	10	5.2
2010	2	26	0	11	-55.76	-4.76	6	5.6
2010	2	26	1	7.82	23.78	122.82	37	5.5
2010	2	26	8	37.02	6.48	126.8	92	5.7
2010	2	26	16	18.73	5.82	125.65	60	5.1
2010	2	27	19	54.86	10.84	-43.41	10	5.5
2010	2	27	23	21.25	35.94	70.07	99	5.7
2010	3	2	1	55.94	42.47	75.63	21	5.1
2010	3	2	2	51.13	18.18	122.4	17	5.8
2010	3	2	22	18.2	3.44	126.84	64	5.1
2010	3	3	11	13.95	3.05	126.93	73	5
2010	3	4	0	18.15	22.93	120.8	22	6.3
2010	3	4	8	16.68	22.9	120.77	23	5.3
2010	3	5	10	14.62	1.89	127.5	107	5
2010	3	5	16	7.07	-3.76	100.98	26	6.8
2010	3	6	0	33.15	48.9	91.48	10	5.1
2010	3	8	2	32.47	38.86	39.99	12	6.1
2010	3	8	7	47.2	38.71	40.05	10	5.6
2010	3	8	11	12.07	38.78	40.14	5	5
2010	3	10	8	7.42	7.13	-34.31	10	5.2
2010	3	11	6	22.84	-57.28	-27.93	307	5.6
2010	3	11	21	9.9	-7.44	128.15	178	5.1
2010	3	12	23	19.51	23.06	94.62	102	5.5
2010	3	13	14	59.32	1.34	97.2	35	5.8
2010	3	14	0	57.47	-1.69	128.13	53	6.4
2010	3	14	20	33.08	-2.75	83.68	10	5.8
2010	3	14	21	17.79	-7.09	67.98	10	5.4
2010	3	14	22	33.06	-58.42	-23.57	40	5.6
2010	3	19	9	30.94	54.48	110.11	9	5.5

2010	3	22	4	36.71	-17.56	-13.08	10	5.2
2010	3	22	19	58.49	18.47	120.74	47	5.9
2010	3	24	2	6.02	32.5	92.7	5	5.7
2010	3	25	5	29.47	13.83	120.07	16	6
2010	3	25	15	13.01	-7.29	128.46	165	5.4
2010	3	26	9	36.67	-1.28	-15.83	10	5.2
2010	3	26	10	39.26	-6.33	130.28	124	5.7
2010	3	30	16	54.67	13.67	92.83	34	6.7
2010	3	31	12	27.4	-42.2	82.26	10	5.1
2010	4	1	14	7.02	30.09	69.54	30	5
2010	4	3	22	33.37	-2.15	100.14	47	5.1
2010	4	5	10	5.6	-0.19	125.01	35	6.2
2010	4	6	22	15.21	2.36	97.13	31	7.8
2010	4	7	4	22.59	2.63	96.93	35	5.1
2010	4	10	2	53.41	-7.15	129.58	97	5.3
2010	4	11	4	57.06	23.25	122.03	32	5.3
2010	4	11	5	59.88	-5.58	101.72	10	5.2
2010	4	11	22	8.15	37.02	-3.52	623	6.3
2010	4	12	7	57.25	76.94	18.92	10	5
2010	4	12	9	48.16	-8.95	124.04	111	4.9
2010	4	12	20	33.96	2.38	97.21	57	5
2010	4	13	20	14.68	7.8	91.84	21	5.3
2010	4	13	21	40.03	33.18	96.62	18	5
2010	4	13	23	49.83	33.23	96.57	17	6.9
2010	4	14	1	25.55	33.19	96.45	7	6.1
2010	4	14	3	15.61	33.07	96.62	10	5
2010	4	17	0	59.3	32.54	92.75	67	5.1
2010	4	17	7	22.92	3.74	126.58	35	5.3
2010	4	17	10	2.46	3.65	126.56	48	5.3
2010	4	18	20	28.02	35.63	67.66	13	5.6
2010	4	20	1	0.37	-55.73	-27.12	39	5.2
2010	4	24	7	41.04	-1.91	128.12	27	6
2010	4	24	15	1.92	34.35	26.06	10	5.2
2010	4	25	21	9.53	-55.59	-27.64	10	5.7
2010	4	26	2	59.1	22.18	123.63	14	6.5
2010	4	26	17	4.02	-55.99	-27.78	97	5.4
2010	4	27	17	17.28	-50.58	115.5	10	5.6
2010	4	27	22	57.95	27.16	54.94	5	4.9
2010	4	28	18	1.14	19.38	93.18	35	5.2
2010	5	1	16	28.68	-58.51	-26.22	35	5.1
2010	5	6	9	13.91	-3.95	100.96	31	5.4
2010	5	7	7	39.97	3.53	127.96	140	5.6

2010	5	7	10	38.36	-24.88	70	10	5.2
2010	5	7	11	44.04	-10.46	123.35	35	5.1
2010	5	8	3	22.96	-8.09	118.25	12	5.8
2010	5	8	5	39.85	-0.68	122.55	20	5.6
2010	5	9	2	2.82	-8.18	128.93	40	5.5
2010	5	9	5	59.25	3.77	96.02	45	7.2
2010	5	9	18	44.08	-55.85	-27.44	35	5.1
2010	5	11	12	17.7	3.5	95.85	40	5.3
2010	5	14	12	29.23	35.9	4.12	2	5.2
2010	5	14	18	49.35	29.33	51.48	10	5.1
2010	5	16	0	33.63	0.51	124.66	123	5.8
2010	5	16	1	8.69	-51.84	28.32	10	5.2
2010	5	16	8	55.62	14.42	93.18	38	5.3
2010	5	16	16	39.31	73.42	7.34	10	5.2
2010	5	16	19	6.7	-34.66	-15.4	10	5.2
2010	5	17	20	5.15	-16.31	-14.19	10	5.2
2010	5	18	11	59.78	-7.84	107.22	34	5.1
2010	5	19	0	13.11	-6.64	105.16	38	5
2010	5	25	6	11.24	31.15	103.55	10	5.3
2010	5	25	10	9.57	35.34	-35.92	10	6.3
2010	5	26	7	14.46	4.55	125.85	136	4.6
2010	5	28	18	32.17	-3.86	100.97	24	5.3
2010	5	29	2	29.86	33.17	96.07	7	5.8
2010	5	31	10	16.23	6.95	124	35	5.9
2010	5	31	19	51.58	11.13	93.47	112	6.5
2010	6	2	1	49.39	-57.37	-26.45	127	5.9
2010	6	3	4	32.25	70.71	-14.38	10	5.6
2010	6	3	5	35.47	33.33	96.15	24	5.5
2010	6	3	9	24.55	4.78	95.79	74	5.4
2010	6	3	20	47.5	33.3	96.09	10	5
2010	6	4	15	12.29	-9.56	108.28	35	5
2010	6	5	17	39.81	13.2	50.78	10	4.5
2010	6	9	8	57.12	1.94	127.17	113	5.3
2010	6	10	6	38.54	39.87	74.85	28	5.1
2010	6	11	2	25.59	17.76	119.39	24	5.1
2010	6	11	12	40.97	-37.31	51.95	10	5.8
2010	6	12	19	26.04	7.88	91.94	35	7.5
2010	6	12	22	28.98	7.72	92.04	30	4.3
2010	6	13	4	1.76	7.86	92.09	37	5
2010	6	13	6	26.47	7.78	91.99	35	5.1
2010	6	13	7	5.56	7.79	91.89	27	5.2
2010	6	15	23	24.76	7.4	91.82	35	5

2010	6	16	0	12.74	36.05	70.31	87	4.6
2010	6	16	7	50.48	14.07	92.86	47	4.8
2010	6	17	16	35.45	-1.17	123.7	43	5.1
2010	6	18	23	9.1	13.2	93.09	20	5.9
2010	6	22	23	14.88	29.87	80.44	3	5.2
2010	6	24	4	8.5	7.7	91.96	20	5.5
2010	6	25	7	29.06	7.59	91.86	35	5.1
2010	6	26	9	50.57	-8.02	108.09	90	5.9
2010	6	27	8	47.2	-4.49	101.34	27	5.5
2010	6	27	23	47.93	5.28	126.98	31	5.2
2010	6	30	10	54.24	-0.74	99.79	88	5.4
2010	6	30	22	34.85	22.96	125.02	5	5.2
2010	7	1	15	21.95	1.24	97.19	37	5
2010	7	1	16	57.92	-5.17	129.38	36	5.8
2010	7	6	19	8.58	29.84	80.4	32	5.2
2010	7	8	13	46.84	14.37	93.26	35	5.2
2010	7	8	19	43.78	24.42	122.11	24	5.3
2010	7	9	0	41.95	24.75	122.6	126	5.4
2010	7	9	10	13.87	-6.04	105.5	67	5.1
2010	7	9	11	16.59	-49.28	120.83	10	5.2
2010	7	11	21	6.69	7.57	91.89	17	4.9
2010	7	12	16	53.68	6.62	123.4	618	5.3
2010	7	13	22	21.52	1.37	97.18	42	5
2010	7	20	17	19.02	-29.03	-13.1	10	5.8
2010	7	20	19	38.95	27.02	53.86	10	5.8
2010	7	21	9	16.44	3.04	128.22	100	6.1
2010	7	23	14	34.32	-4.53	102.45	35	5.1
2010	7	23	22	8.12	6.72	123.41	607	7.3
2010	7	23	23	2.85	6.72	124.03	591	5.4
2010	7	24	2	11.56	1	99.54	42	5.3
2010	7	24	5	1.83	6.88	123.84	595	4.4
2010	7	24	5	35.1	6.22	123.52	553	6.6
2010	7	24	15	17.05	-1.35	99.53	35	5
2010	7	24	19	17.6	-12.55	114.52	10	5
2010	7	24	20	28.56	-8.14	68.03	10	5.4
2010	7	24	23	51.26	-1.42	120.64	46	5.1
2010	7	25	3	52.16	22.76	120.84	32	5.4
2010	7	25	8	18.91	6.82	123.56	618	5.2
2010	7	26	16	37.27	6.8	123.62	606	5
2010	7	26	23	6.97	6.67	123.25	625	5.4
2010	7	29	7	31.68	6.53	123.25	627	6.6
2010	7	30	11	39.54	2.09	126.58	50	5.3

2010	7	30	13	50.32	35.22	59.31	24	5.4
2010	8	2	21	47.18	-37.4	78.29	10	5.2
2010	8	2	23	13.98	-6.5	104.62	41	5.4
2010	8	3	1	48.28	10.94	93.25	83	5.1
2010	8	3	8	3.01	-6.35	103.96	47	5.3
2010	8	3	12	8.59	1.24	126.21	41	6.3
2010	8	3	16	26.5	38.45	69.64	23	5.4
2010	8	6	8	58.95	-7.4	128.45	57	5.5
2010	8	9	2	54.08	30.31	94.83	44	5
2010	8	9	3	34.59	-6.08	113	598	5.2
2010	8	9	22	21.32	13.61	92.82	20	5.4
2010	8	11	19	10.14	-7.49	107.06	37	5.4
2010	8	13	5	40.8	36.97	-32.78	10	5.4
2010	8	13	7	58.87	36.88	-32.87	10	5.4
2010	8	15	7	50.6	-36.81	-71.1	8	5.2
2010	8	16	3	30.33	-17.76	65.65	9	6.3
2010	8	16	22	19.72	-8.55	112.53	73	5
2010	8	20	13	8.74	-55.88	-28.06	112	5.1
2010	8	20	16	57.55	39.32	71.82	13	5.2
2010	8	21	5	42.28	2.22	96.72	24	6
2010	8	22	8	6.26	-21.14	-67.27	152	5.1
2010	8	24	8	34.96	36.51	71.25	226	5
2010	8	24	20	48.46	6.75	123.56	594	5
2010	8	25	6	25.54	0.4	123.84	210	5.1
2010	8	25	13	14.76	-35.09	-72.25	31	5
2010	8	25	16	46.45	2.7	128.62	234	5.1
2010	8	27	0	17.65	-55.96	-27.87	125	5.2
2010	8	27	9	10.31	-55.47	-27.85	35	5.2
2010	8	29	6	37.89	-55.8	-26.99	35	5.4
2010	9	2	0	16.94	12.79	92.56	24	5.1
2010	9	3	4	19.36	-13.94	65.93	10	5.7
2010	9	4	11	51.88	-59.08	-25.49	35	5.4
2010	9	4	23	0.25	-37.99	49.07	14	5.2
2010	9	6	17	15.68	-4.12	103.58	138	5.2
2010	9	7	0	57.21	-6.92	103.46	8	5.5
2010	9	7	0	57.27	-6.91	103.46	10	5.5
2010	9	9	7	28.17	-37.03	-73.41	16	6.2
2010	9	9	10	31.51	59.4	-30.23	10	5.2
2010	9	11	11	43.86	7.79	94.06	10	5.8
2010	9	13	2	48.71	0.74	-29.04	10	5
2010	9	14	7	33.9	5.64	124.64	49	5.2
2010	9	14	13	8.67	5.66	124.58	35	5.1

2010	9	15	18	42.76	5.95	125.99	94	5.2
2010	9	17	3	25.23	-21.59	-67.02	201	5.4
2010	9	17	19	21.5	36.44	70.77	220	6.3
2010	9	17	19	21.51	36.44	70.77	220	6.3
2010	9	20	5	42.66	-33.64	-71.93	30	5.1
2010	9	26	5	33.12	5.75	126.03	146	5.3
2010	9	27	0	8.59	57.69	-32.76	11	5.5
2010	9	27	11	22.51	29.64	51.67	20	5.9
2010	9	27	11	22.6	29.65	51.67	26	5.8
2010	9	29	11	33.21	5	94.74	54	5.2
2010	9	29	22	36.92	2.38	126.74	44	5
2010	9	30	9	0.44	19.71	121.47	15	5.8
2010	10	1	1	24.61	-10.93	113.79	15	5.5
2010	10	1	5	0.89	5.27	125.41	194	5
2010	10	2	11	29.54	-6.56	128.75	239	5.5
2010	10	3	4	30.54	-47.29	100.25	10	5.5
2010	10	3	8	21.86	-6.53	105	53	5.1
2010	10	3	15	20.78	34.93	26.54	10	5.3
2010	10	4	1	38.94	19.35	122.16	30	5.5
2010	10	4	13	28.88	24.27	125.15	32	6.3
2010	10	6	17	49.34	29.72	69.59	10	5.2
2010	10	6	21	57.13	6.63	124.84	51	5.5
2010	10	7	1	40.33	39.15	70.29	3	5.1
2010	10	8	5	43.76	2.83	128.23	116	6.1
2010	10	16	19	51.12	6.63	94.34	94	5.3
2010	10	17	10	15.17	12.96	92.36	35	5
2010	10	17	21	49.2	28.03	104.21	35	5
2010	10	21	2	49.6	-34.74	-73.72	10	5.9
2010	10	23	5	58.77	-37.74	-73.36	15	5.5
2010	10	23	10	56.94	-36.78	-73.41	28	5.1
2010	10	23	18	37.62	9.27	125.73	46	5
2010	10	25	12	5.89	-0.07	125.06	37	5.8
2010	10	25	14	42.21	-3.49	100.08	20	7.8
2010	10	25	14	42.24	-3.49	100.08	20	7.8
2010	10	25	19	37.11	-2.96	100.37	26	6.3
2010	10	25	22	10.3	-2.81	100.09	18	5
2010	10	25	23	12.8	-3.41	99.48	10	5
2010	10	26	10	51.3	-3.7	99.75	10	5.5
2010	10	26	19	40.76	-3.6	99.79	4	5.1
2010	10	27	0	4.31	-3.5	99.66	32	5.2
2010	10	27	18	46.24	-60.49	-24.36	35	5.4
2010	10	28	3	59.21	36.52	71.1	187	5.2

2010	10	29	2	25.23	-12.49	63.28	10	5.2
2010	10	29	18	5.36	-3.42	99.65	5	5
2010	10	31	7	10.05	-33.66	-71.86	29	5.2
2010	11	3	3	1.21	-6.34	104.06	57	5.4
2010	11	3	14	10.63	2.53	126.22	62	5.5
2010	11	3	22	24.12	12.75	123	56	5
2010	11	4	12	29.13	12.84	-44.85	10	5.4
2010	11	5	12	13.2	6.99	126.69	185	5.1
2010	11	5	16	40.69	12.74	123.05	10	5.7
2010	11	7	14	19.7	-3.67	99.65	2	5
2010	11	8	7	37.89	-37.09	78.23	10	5
2010	11	9	7	3.03	-8.63	110.03	63	5.4
2010	11	9	11	16.04	-1.74	99.42	27	5.3
2010	11	9	12	38.96	-7.86	107.21	56	5.1
2010	11	10	3	9.68	0.46	126.11	53	5.3
2010	11	10	4	5.44	-45.46	96.39	10	6.5
2010	11	10	10	30.51	14.92	119.87	21	5.5
2010	11	10	10	30.56	14.92	119.87	21	5.4
2010	11	11	3	34.7	1.43	126.42	54	5.1
2010	11	11	18	47.62	-59.55	-26.22	35	5.4
2010	11	12	2	14.62	-6.55	130.04	168	5.5
2010	11	12	13	8.05	24.14	122.49	43	5
2010	11	14	6	32.79	11.98	43.96	10	5.5
2010	11	14	13	50.35	11.93	43.94	10	5
2010	11	14	15	6.06	11.91	43.64	11	5.3
2010	11	14	17	2.76	11.86	43.72	10	5.5
2010	11	14	22	22	11.91	43.58	10	5.2
2010	11	14	23	8.5	36.58	36.01	2	5
2010	11	15	0	51.62	34.56	70.46	35	5.1
2010	11	16	2	6.52	11.95	43.96	10	5.1
2010	11	16	18	44.81	-3.01	68.12	10	5.5
2010	11	16	18	44.83	-3.01	68.12	10	5.5
2010	11	19	21	55.51	1.18	100.12	213	5.7
2010	11	19	21	55.6	1.19	100.13	217	5.7
2010	11	21	12	31.54	23.83	121.66	47	5.6
2010	11	25	9	27.13	38.28	73.03	103	5
2010	11	26	12	33.21	28.06	52.56	9	5.5
2010	11	26	12	33.21	28.08	52.57	8	5.5
2010	11	26	13	1.26	10.9	-43.72	10	5.3
2010	11	26	22	12.85	-2.62	129.26	28	5.1
2010	11	27	2	44.26	10.29	-43.13	10	5.8
2010	11	27	18	11.35	3.86	128.07	58	5.7

2010	11	27	20	48.73	3.85	127.86	108	5.2
2010	11	28	19	45.88	-6.56	130.53	94	5.1
2010	11	29	1	37.26	-17.9	-13.72	10	5.1
2010	11	29	10	27.17	-8.02	106.93	58	5
2010	11	29	19	57.38	-24.01	-66.71	182	5
2010	11	30	8	39.69	29.79	90.34	10	5.3
2010	11	30	21	19.43	-4.1	79.82	10	5.3
2010	12	1	0	50.16	2.69	99.04	159	5.5
2010	12	1	10	1.3	-33.76	-71.74	22	4.9
2010	12	1	19	55.65	30.16	51.58	34	5.1
2010	12	6	1	55.83	-8.91	127.08	22	5.1
2010	12	6	7	56.48	-3.77	100.18	35	5.3
2010	12	7	4	27.2	-57.93	-7.47	10	5.9
2010	12	7	4	27.21	-57.93	-7.47	10	5.9
2010	12	7	5	31.31	-58.02	-7.5	10	5.7
2010	12	7	5	31.38	-58.02	-7.5	10	5.7
2010	12	7	9	38.22	-55.78	-26.71	40	5.4
2010	12	8	5	24.51	-56.41	-25.74	29	6.3
2010	12	8	5	24.52	-56.41	-25.74	29	6.3
2010	12	8	6	47.47	7.49	126.55	42	5.9
2010	12	8	8	21.35	39.32	72.84	10	5.5
2010	12	8	15	31.58	-6.69	129.9	171	5.5
2010	12	8	16	5.89	-56.25	-25.39	10	5
2010	12	8	18	10.87	-56.4	-25.48	24	5.1
2010	12	8	19	5.45	-56.34	-25.51	30	5
2010	12	9	4	4.65	-7.15	125.12	537	5
2010	12	9	14	40.79	-56.4	-25.73	10	5.2
2010	12	9	23	17.34	31.54	70.08	16	5.2
2010	12	10	10	13.34	-37.37	78.08	10	5
2010	12	10	17	48.15	23.86	-45.73	10	5.3
2010	12	11	15	34.13	30.45	69.46	35	5.1
2010	12	11	20	35.26	-56.83	-25.41	46	5
2010	12	12	12	8.83	32.37	69.65	56	5
2010	12	12	15	59.96	-5.97	117.71	31	5.4
2010	12	13	9	18.21	-6.26	104.01	43	5.7
2010	12	13	9	18.23	-6.26	104.01	42	5.7
2010	12	13	13	30.01	-8.09	119.81	191	5.2
2010	12	13	18	51.53	-33.99	-73.08	29	5.4
2010	12	14	19	11.14	3.82	-32.56	10	5
2010	12	14	20	1.03	3.88	96	58	5
2010	12	15	4	23.36	-37.29	78.17	10	5.1
2010	12	15	11	29.08	-7.27	128.79	134	6

2010	12	16	20	3.65	10.44	126.19	70	4.9
2010	12	17	13	22.53	-6.48	130	154	5.5
2010	12	18	5	6.16	10.41	126.16	14	5.6
2010	12	18	6	5.15	37.28	20.22	24	5
2010	12	18	22	56.3	5.42	94.67	55	5.1
2010	12	19	11	51.47	38.38	73.68	123	5.2
2010	12	20	18	41.9	28.4	59.17	12	6.7
2010	12	20	18	41.91	28.41	59.18	12	6.7
2010	12	21	3	59.81	-8.7	111.2	55	5.6
2010	12	21	3	59.83	-8.7	111.2	54	5.6
2010	12	21	14	7.81	2.71	95.89	21	5.8
2010	12	21	14	7.82	2.71	95.89	21	5.9
2010	12	22	20	40.84	-39.29	46.28	10	5.2
2010	12	23	0	1.73	3.95	95.96	39	5.4
2010	12	23	16	28.47	-8	119.95	206	5.5
2010	12	25	21	16.21	6	127.43	74	5.1
2010	12	27	17	2.28	-50.81	139.38	10	5.6
2010	12	28	2	47.11	-52.92	27.32	10	5
2010	12	29	18	30.94	30.94	86.52	19	5.2
2010	12	30	6	49.8	-56.05	-26.71	38	5
2010	12	30	8	56.47	51.47	16.06	5	5
2010	12	31	16	30.45	0.66	-26.05	10	5.3
2011	1	1	1	56.6	39.47	75.25	10	5.1
2011	1	2	3	36.52	36.19	68.97	28	5
2011	1	2	15	19.1	-4.46	101.43	21	5.8
2011	1	2	21	10.2	-38.38	-74.33	32	4.9
2011	1	5	10	15.59	-2.65	100	12	5.4
2011	1	6	16	36.2	20.23	-45.74	10	5.2
2011	1	7	1	19.67	20.11	-45.62	10	5.2
2011	1	7	3	9.81	4.24	90.41	17	5.5
2011	1	7	3	9.88	4.24	90.41	17	5.5
2011	1	7	4	55.72	-21.78	-65.34	290	5.1
2011	1	7	19	28.45	-53.51	25.19	10	5.2
2011	1	8	4	10.66	-0.03	124.91	56	5.6
2011	1	8	8	15.29	-1.15	120.09	10	5
2011	1	10	3	21.55	-5.32	68.54	10	5
2011	1	10	8	35.66	0.78	123.29	80	5
2011	1	11	5	33.38	-35.62	-71.94	35	5
2011	1	12	1	45.56	3.56	126.53	47	5.3
2011	1	15	11	23.32	2.49	96.29	19	5.8
2011	1	15	12	56.67	-5.65	130.25	198	5.7
2011	1	16	11	59.27	-6.55	128.99	213	5.3

2011	1	17	1	35.17	-21.04	-11.55	10	5.3
2011	1	17	11	19.66	-3.61	100.54	26	5
2011	1	18	7	49.39	34.42	-36.84	10	5
2011	1	18	11	33.51	2.63	96.4	21	5.9
2011	1	18	14	46.22	-57.19	-26.92	130	5.2
2011	1	18	20	23.31	28.78	63.95	68	7.2
2011	1	18	20	23.35	28.78	63.94	68	7.2
2011	1	19	3	47.65	39.32	72.25	39	5
2011	1	19	5	20	-33.96	-72.45	12	5.3
2011	1	19	9	17.97	41.96	42.66	10	5.2
2011	1	19	21	22	-33.9	-72.36	24	5
2011	1	20	3	44.58	-59.94	-27.48	129	5.2
2011	1	22	7	34.74	2.89	95.52	28	5.4
2011	1	22	14	18.61	-4.72	129.22	210	4.8
2011	1	23	22	53.15	-56.47	-26.96	124	5.3
2011	1	24	2	45.11	38.41	72.79	110	6
2011	1	25	5	39.74	-52.91	22.34	10	5
2011	1	25	23	57.9	-18.85	67.35	10	5.1
2011	1	26	15	42.95	2.2	96.83	23	6.1
2011	1	27	7	2.34	28.17	58.91	10	5
2011	1	27	8	38.81	28.19	59.01	10	6.2
2011	1	28	15	45.25	1.99	96.76	23	5
2011	1	28	23	57.16	-41.02	80.83	10	5.1
2011	1	29	6	55.61	70.94	-6.68	6	6.2
2011	1	30	2	28.42	12.02	44.07	16	5
2011	2	1	13	39.7	10.62	94.11	21	5.6
2011	2	4	13	53.61	24.62	94.68	85	6.2
2011	2	6	11	21.61	24.62	94.68	85	6.2
2011	2	6	11	21.73	-8.27	104.07	13	5.7
2011	2	7	8	8.6	0.78	98.78	75	5.3
2011	2	8	15	27.04	-9.98	113.9	52	5.3
2011	2	10	2	12.5	-27.62	-70.32	61	5.1
2011	2	10	5	35.65	52.13	91.78	10	5.5
2011	2	12	2	53.43	0.09	-17.02	5	5.6
2011	2	12	2	53.51	0.08	-17.02	10	5.7
2011	2	12	11	55.48	2	126.86	35	5.7
2011	2	13	13	44.64	-36.56	-73.28	18	5.6
2011	2	14	10	21.35	-35.44	-73.1	10	5
2011	2	15	7	18.85	21.1	121.19	32	5.5
2011	2	15	13	33.31	-2.5	121.48	16	6.1
2011	2	15	13	33.31	-2.5	121.48	16	6.1
2011	2	18	17	0.89	-33.94	-72.16	10	5.2

2011	2	18	23	12.58	1.89	97.87	54	5.3
2011	2	19	6	26.1	-34.03	-72.23	15	5.2
2011	2	20	9	9.8	13.67	51.64	10	5.2
2011	2	20	14	32.48	1.36	97.2	40	5.3
2011	2	22	2	10.45	14.13	120.65	141	5.2
2011	2	24	4	36.8	-36.27	-73.81	33	5
2011	2	25	22	8.67	-3.05	100.9	40	5
2011	2	26	6	29.54	-6.56	107.19	187	5
2011	2	28	7	49.47	34.87	25.41	34	5.2
2011	2	28	9	13.41	-20.07	67.39	10	5
2011	3	3	4	30.57	-4.42	101.12	19	5.1
2011	3	3	15	12.14	9.46	125.94	49	5.5
2011	3	5	20	42.39	28.3	57.14	19	5.2
2011	3	6	14	32.6	-56.42	-27.06	87	6.5
2011	3	6	14	32.61	-56.42	-27.06	88	6.5
2011	3	7	23	35.19	-55.92	-27.94	133	5.1
2011	3	9	13	57.8	8.65	92.41	23	5.3
2011	3	10	4	58.31	24.73	97.96	10	5.5
2011	3	10	17	8.61	-6.87	116.72	510	6.5
2011	3	12	8	45.84	-7.17	129.15	162	4.9
2011	3	12	18	28.05	-56.94	-28.07	250	4.9
2011	3	17	0	55.2	-32.5	-71.61	30	5.1
2011	3	17	1	0.79	-57.92	-25.61	84	5.4
2011	3	17	11	14.66	-32.53	-71.47	39	5
2011	3	17	15	34.49	40.48	79.08	32	5
2011	3	19	2	33.76	0.83	97.45	35	5.2
2011	3	19	18	43.32	-10.25	-13.23	10	5.4
2011	3	20	8	0.28	22.34	121.44	35	5.4
2011	3	21	9	49.11	36.49	70.93	190	5.8
2011	3	21	10	36	13.91	120.57	101	5.5
2011	3	22	5	44.4	-57.48	-25.98	101	5
2011	3	22	13	31.71	-33.1	-15.98	5	5.8
2011	3	22	13	31.85	-33.1	-15.98	10	5.9
2011	3	22	14	45.91	-33.18	-15.9	10	5.1
2011	3	22	19	40.45	-7.61	127.64	149	5
2011	3	23	5	55.38	36.28	76.49	76	5.1
2011	3	24	13	55.21	20.69	99.82	8	6.9
2011	3	24	15	54.51	20.65	99.77	10	5.7
2011	3	25	9	14.05	1.14	99.08	110	5.2
2011	3	28	6	10.23	-34.83	-71.54	46	5.2
2011	3	28	23	57.75	-33.83	-72.04	11	5.1
2011	3	29	10	48.82	23.19	124.56	10	5.3

2011	4	1	13	29.01	35.66	26.56	60	6
2011	4	3	20	6.01	-9.85	107.69	14	6.7
2011	4	8	0	56.33	-7.82	123.42	250	5
2011	4	8	18	29.01	13.83	120.08	57	5.2
2011	4	13	15	14.3	-33.75	-71.84	34	5.1
2011	4	13	19	54.87	45.43	98.58	18	5.4
2011	4	14	16	11.5	5.9	126.24	154	5.2
2011	4	15	5	2.57	-55.62	-28.1	55	5.3
2011	4	16	1	11.07	25.42	123.89	134	5.8
2011	4	19	0	57.9	-33.36	-72.05	20	5.2
2011	4	19	3	53.56	-56.57	-25.62	38	5
2011	4	19	16	27.68	34.29	89.58	15	5
2011	4	19	23	29.21	-44.47	-15.85	15	5.4
2011	4	19	23	29.41	-44.41	-16.06	16	5.5
2011	4	24	22	44.66	-35.24	-17.02	9	5.6
2011	4	24	23	7.14	-4.59	122.77	8	6.1
2011	4	25	0	54.29	36.23	72.18	89	5
2011	4	26	6	39.61	-8.08	108.48	95	5.6
2011	4	27	4	57.2	-33.95	-72.5	24	5.1
2011	4	29	7	31	-34.06	-72.28	28	5
2011	4	29	8	56.79	4.03	95.76	46	5.4
2011	4	29	13	12.61	21.13	122.01	181	5.3
2011	4	29	20	24.44	-3.53	100.63	24	5.2
2011	5	1	2	31.96	43.56	77.75	23	5.3
2011	5	1	4	39.36	-1.22	-14.44	10	4.9
2011	5	1	11	6.66	6.55	126.89	83	5
2011	5	3	15	52.43	23.88	121.76	43	4.7
2011	5	4	4	50.61	-49.24	120.85	10	5.1
2011	5	5	8	45.9	-0.2	124.48	73	5.1
2011	5	6	6	46.34	-0.06	122.95	82	5.5
2011	5	6	16	20.95	32.33	-40.04	9	5.2
2011	5	6	16	20.95	32.33	-40.08	10	5.2
2011	5	7	6	57.1	-34.02	-72.32	42	5
2011	5	7	12	3.58	-23.9	69.5	10	5
2011	5	8	15	51.88	1.07	125.31	85	4.9
2011	5	10	13	3.28	-55.96	-27.41	92	5
2011	5	10	14	32.62	1.47	126.36	41	5.2
2011	5	11	1	28.83	6.04	125.95	110	4.9
2011	5	11	7	54.12	1.53	127.25	107	5.2
2011	5	11	16	47.57	37.7	-1.67	1	5.1
2011	5	12	7	4.86	-10.12	-13.15	10	5.2
2011	5	13	21	43.04	-9.98	107.65	10	5.3

2011	5	14	1	42.6	-8.13	123.67	44	5.1
2011	5	14	21	7.21	36.41	70.75	207	5.9
2011	5	15	13	8.3	0.57	-25.65	10	6.1
2011	5	18	5	1.94	-9.29	112.56	35	5.1
2011	5	19	17	5.15	-34.68	-71.48	44	5.2
2011	5	19	20	15.21	39.15	29.1	7	5.8
2011	5	21	0	16.51	-56.07	-27.11	48	5.9
2011	5	21	0	16.55	-56.07	-27.11	48	5.9
2011	5	21	13	8.44	17.19	121.72	35	5.3
2011	5	21	16	30.03	31.25	-41.02	10	5
2011	5	22	1	34.23	24.09	121.76	5	5
2011	5	22	16	42.44	13.6	120.75	148	5.7
2011	5	23	10	19.33	-55.99	-27.07	50	5.1
2011	5	25	12	28.56	-34.73	-15.09	10	5
2011	5	27	5	39.06	1.54	123.9	286	5.1
2011	5	27	20	27.81	-12.72	66.34	15	5.1
2011	5	27	21	1.08	-7.1	103.41	35	5
2011	5	28	20	17.29	4.69	127.67	85	5.4
2011	5	29	18	24.12	-7.72	101.76	13	5.9
2011	6	2	12	30.71	-11.7	-13.21	10	5.2
2011	6	3	7	27.11	9.64	92.46	45	5.5
2011	6	3	7	27.18	9.64	92.46	45	5.5
1911	6	3	14	36.06	-55.66	-25.56	10	5
2011	6	7	2	54.32	1.14	96.75	33	5
2011	6	7	5	11.18	-44.44	-15.81	10	5.4
2011	6	8	1	53.6	43.01	88.25	21	5.3
2011	6	8	16	32.84	1.17	96.78	20	5.3
2011	6	9	9	51.38	14.12	92.88	39	4.9
2011	6	11	11	21.18	-58.28	-14.02	10	5.4
2011	6	12	15	37.41	13.42	41.69	1	5.1
2011	6	12	19	21.08	13.3	41.8	10	5
2011	6	13	14	31.29	2.52	126.46	61	6.3
2011	6	13	18	47.35	-56.12	-27.33	94	5.1
2011	6	14	0	8.51	1.86	99.23	35	5.5
2011	6	17	22	8.99	-23.88	69.53	10	5.4
2011	6	19	4	15.89	-3.25	101.36	57	5.4
2011	6	19	8	37.46	-56.05	-27.42	119	5.2
2011	6	20	10	16.52	25.08	98.72	39	5.3
2011	6	20	16	36.11	-21.7	-68.23	128	6.4
2011	6	21	14	47.09	39.21	72.5	52	5
2011	6	22	13	57.12	-27.96	-66.56	163	5.3
2011	6	24	5	12.01	-12.72	66.35	10	5.1

2011	6	24	17	23.37	6.65	123.57	597	5
2011	6	26	7	48.67	32.45	95.95	29	5.3
2011	6	27	16	47.41	-8.93	122.47	120	5.5
2011	6	27	16	47.42	-8.93	122.47	119	5.5
2011	6	28	9	50.54	4.68	125.23	51	5.2
2011	6	29	4	19.22	-5.04	101.89	31	5.3
2011	6	29	5	36.6	-33.91	-72.34	19	5.5
2011	6	30	13	37.62	-7.11	68	10	5.2
2011	7	7	19	21.83	42.03	7.72	10	5.3
2011	7	8	5	22.08	0.13	123.24	159	5.3
2011	7	9	5	51.85	-4.14	129.4	21	5.5
2011	7	10	16	42.75	9.53	122.26	10	5.1
2011	7	12	8	56.54	9.7	122.29	10	5.3
2011	7	15	13	26.29	-60.76	-23.52	10	6.1
2011	7	16	0	26.26	-33.82	-71.83	20	6
2011	7	16	8	58.32	-60.55	-26.66	10	5.2
2011	7	17	10	59.96	-6.64	106.49	94	5
2011	7	19	7	13.22	37.21	19.92	9	5.1
2011	7	19	19	35.31	40.08	71.41	20	6.1
2011	7	25	17	15.01	14.95	120.04	35	5.9
2011	7	26	14	26.21	-9.23	67.11	10	5.8
2011	7	27	23	0.91	10.8	-43.39	6	5.9
2011	7	28	16	5.97	-35.76	-73.1	35	5.2
2011	8	3	14	35.12	-3.41	100.19	14	5.2
2011	8	3	20	2.84	0.97	98.79	78	5.2
2011	8	4	0	16.74	-2.83	101.1	35	5.8
2011	8	6	2	45.55	-2.91	101.09	44	5.3
2011	8	9	14	4.39	-56.12	-27.11	108	5
2011	8	10	0	53.41	27.72	65.08	37	5.7
2011	8	10	23	45.31	-7.04	-12.62	10	6
2011	8	16	20	24.31	-57.23	-25.45	44	5.7
2011	8	22	20	12.01	-6.28	104.05	29	6.1
2011	8	31	12	17.71	43.59	-28.9	10	5.5
2011	9	3	4	48.71	-56.45	-26.85	84	6.4
2011	9	5	17	55.11	2.96	97.89	91	6.7
2011	9	22	3	22.61	39.78	38.84	5	5.5
2011	10	13	3	16.01	-9.35	114.59	39	6.1
2011	10	25	14	55.81	38.81	43.62	14	5.6
2011	11	1	0	21.81	48.65	82.44	28	5.6
2011	11	7	11	59.11	36.5	71.1	212	5.6
2011	11	9	19	23.31	38.43	43.23	5	5.6
2011	11	21	3	15.11	24.96	95.23	107	5.7

2011	11	23	12	17.11	34.28	25.08	10	5.5
2011	11	28	9	13.11	-7.02	116.98	616	5.8
2011	11	29	0	30.91	-1.6	-15.45	10	5.9
2011	11	30	19	42.21	7.8	93.84	6	5.6
2011	12	2	5	19.61	0.12	120.5	75	5.5
2011	12	11	9	54.51	-56.01	-28.18	116	6.2
2011	12	13	7	52.11	0.04	123	161	6
2011	12	27	15	21.61	51.84	95.91	15	6.6
2012	1	12	14	11.81	-52.11	28.15	10	5.5
2012	1	13	16	2.31	-60.55	-27.07	10	5.6
2012	1	15	13	40.61	-60.97	-56.07	10	5.9
2012	1	20	20	32.31	-8.41	119.7	126	5.7
2012	2	4	21	50.01	13.05	57.56	10	5.5
2012	2	23	5	8.21	-17.7	-13.19	10	5.5
2012	2	26	6	17.91	51.71	95.99	12	6.7
2012	3	5	7	46.01	-28.25	-63.29	554	6.1
2012	3	8	22	50.81	39.38	81.31	38	5.9
2012	3	12	6	6.01	36.74	73.15	11	5.6
2012	3	17	17	0.61	3.82	63.4	10	5.5
2012	3	26	16	58.01	-30.04	60.65	10	5.6
2012	4	10	5	9.81	-1.26	-13.97	10	5.8
2012	4	11	10	43.01	0.8	92.46	25	8.2
2012	4	11	23	56.21	1.84	89.68	10	5.8
2012	4	14	10	56.91	-57.68	-65.31	15	6.2
2012	4	15	5	57.01	2.58	90.27	25	6.2
2012	4	16	2	17.01	-2.64	121.86	13	5.8
2012	4	17	19	3.61	-59.02	-16.61	12	6.2
2012	4	20	22	28.91	3.27	93.82	22	5.9
2012	4	20	23	14.11	2.16	93.36	28	5.8
2012	4	24	9	50.81	5.65	61.51	10	5.6
2012	4	29	8	9.41	2.7	94.51	14	5.7
2012	5	7	4	40.71	41.55	46.79	11	5.6
2012	5	9	14	49.11	-0.97	-13.6	12	5.5
2012	5	13	1	19.01	-3.35	89.42	12	5.3
2012	5	22	0	0.21	42.65	22.97	10	5.6
2012	5	29	10	55.71	44.89	11.01	7	5.5
2012	6	2	7	52.31	-22.06	-63.56	527	5.9
2012	6	10	12	44.61	36.42	28.88	35	5.5
2012	6	23	4	34.31	3.01	97.9	95	6.1
2012	6	24	7	59.41	27.77	100.78	10	5.5
2012	6	29	15	31.61	-24.75	-9.66	10	5.8
2012	6	29	21	7.31	43.43	84.7	18	6.3

2012	7	1	4	13.21	25.59	94.7	58	5.6
2012	7	9	13	55.01	35.6	28.92	56	5.6
2012	7	12	14	0.41	36.53	70.91	198	5.6
2012	7	19	7	36.51	37.25	71.38	98	5.6
2012	7	25	0	27.51	2.71	96.04	22	6.4
2012	7	26	5	33.31	-17.59	66.39	20	6.7
2012	7	29	2	21.21	22.93	94.3	75	5.7
2012	8	11	12	23.81	38.33	46.83	11	6.4
2012	8	12	10	47.61	35.66	82.52	13	6.2
2012	8	18	9	41.21	-1.32	120.1	10	6.3
2012	8	21	17	38.81	-0.17	92.06	15	5.6
2012	8	26	15	5.71	2.19	126.84	91	6.6
2012	8	30	12	18.31	-50.14	114.08	10	5.6
2012	9	3	6	49.91	6.61	123.88	12	5.8
2012	9	3	18	23.51	-10.71	113.93	14	6.1
2012	9	7	3	19.21	27.58	103.98	10	5.5
2012	9	12	3	27.61	34.78	24.11	32	5.5
2012	9	14	4	51.71	-3.32	100.59	19	6.2
2012	9	15	16	32.11	-10.73	113.86	10	5.7
2012	10	3	13	32.41	-0.43	97.67	9	5.7
2012	10	4	23	14.61	17.44	-46.5	10	5.4
2012	10	5	0	19.61	17.48	-46.46	10	5.7
2012	10	7	3	14.41	18.54	120.94	40	5.6
2012	10	14	10	13.81	41.83	46.4	10	5.5
2012	10	17	4	42.01	4.23	124.52	326	6
2012	10	18	1	27.61	-54.22	144.01	8	5.9
2012	10	19	10	13.41	-9.29	67.06	10	5.6
2012	10	29	15	29.01	0.14	125.18	35	5.7
2012	11	1	14	12.11	-6.76	107.53	142	5.7
2012	11	1	23	37.81	1.23	122.11	35	5.4
2012	11	3	12	58.21	7.05	-34.07	10	5.6
2012	11	6	1	36.11	1.37	122.2	25	5.7
2012	11	6	6	17.71	9.96	57.2	10	5.6
2012	11	7	6	26.21	38.42	46.62	10	5.4
2012	11	11	1	12.81	23	95.89	14	6.8
2012	11	11	10	54.11	22.72	95.83	6	5.8
2012	11	11	18	19.51	23.13	95.87	28	5.5
2012	11	14	5	21.21	9.98	122.47	41	5.7
2012	11	22	13	7.01	-22.74	-63.57	517	5.9
2012	12	5	17	81.11	33.51	59.57	14	5.8
2012	12	17	9	16.01	-0.65	123.81	44	6.1
2012	12	22	16	41.51	22.44	94.78	134	5.5

2012	12	23	13	31.01	42.42	41.08	15	5.7
2012	12	29	17	50.21	35.71	70.6	117	5.5
2013	1	8	14	16.81	39.66	25.54	13	5.7
2013	1	9	1	41.31	25.33	95.05	93	5.8
2013	1	10	13	47.31	4.72	95.1	38	5.7
2013	1	21	22	22.21	4.93	95.91	12	6.1
2013	1	28	16	38.31	42.6	79.71	15	6.1
2013	2	18	3	40.81	5.54	-32.96	10	5.5
2013	2	22	12	1.81	-27.93	-63.1	575	6.1
2013	2	23	11	9.91	-8.47	127.47	20	5.9
2013	3	19	3	28.81	-58.89	-24.33	20	5.9
2013	4	2	14	34.51	-40.44	45.38	9	5.9
2013	4	5	22	55.11	36.45	71.46	104	5.4
2013	4	9	11	52.91	28.43	51.59	12	6.4
2013	4	16	10	44.01	28.03	62	80	7.7
2013	4	17	3	15.21	28.11	62.35	56	5.6
2013	4	19	17	51.11	-11.98	121.63	15	5.8
2013	4	20	0	2.71	30.31	102.89	14	6.6
2013	4	20	5	11.71	-54.78	1.17	11	5.8
2013	4	24	9	25.01	34.53	70.22	64	5.5
2013	4	30	6	25.31	37.59	-24.91	10	5.9
2013	5	1	6	57.31	33.06	75.86	15	5.7
2013	5	10	19	56.41	-28.98	-13.23	4	5.7
2013	5	11	2	8.81	26.56	57.77	15	6.1
2013	5	12	0	6.91	26.4	57.52	17	5.5
2013	5	12	10	54.81	26.72	57.76	14	5.5
2013	5	14	19	18.61	0.76	92.4	17	5.6
2013	5	16	5	57.01	-57.51	-6.8	10	5.6
2013	5	18	4	5.21	-53.07	22.07	10	5.6
2013	5	18	10	3.61	26.61	57.78	15	5.5
2013	5	26	6	8.51	39.96	67.31	18	5.7
2013	5	27	3	36.01	14.55	53.89	10	5.9
2013	6	7	20	13.31	-43.75	-16.18	7	5.6
2013	6	13	16	47.31	-10	107.24	9	6.7
2013	6	15	16	11.21	34.4	25.02	10	6.2
2013	6	16	2	51.51	-56.28	-27.44	91	5.5
2013	6	16	21	39.51	34.35	25.16	19	6
2013	6	24	22	4.31	10.7	-42.59	10	6.6
2013	6	26	22	59.01	-0.14	125.05	33	5.5
2013	6	28	23	51.91	24.09	122.23	15	5.7
2013	7	2	7	37.21	4.64	96.67	13	6.1
2013	7	2	13	55.71	4.66	96.65	10	5.5

2013	7	6	5	5.61	-3.27	100.56	21	6
2013	7	9	17	4.51	-3.36	100.46	17	5.6
2013	7	15	14	3.91	-60.86	-25.07	11	7.3
2013	7	16	19	41.31	-63.38	-62.54	9	5.7
2013	7	21	23	45.61	34.51	104.26	8	5.9
2013	7	22	7	1.21	-46.05	34.78	10	6.3
2013	7	26	21	32.91	-57.92	-23.84	13	6.3
2013	8	11	21	23.13	30.05	97.96	6	5.7
2013	8	15	4	5.51	0.01	123.19	151	5.3
2013	8	17	16	32.14	-34.89	54.09	10	6.1
2013	8	25	16	7.46	-33.46	57.04	5	5.8
2013	8	28	5	43.51	-2.02	100.76	63	5.4
2013	8	31	0	4.77	28.24	99.35	8	5.6
2013	9	3	0	41.71	-33.78	56.09	10	5.3
2013	9	5	4	1.63	15.18	-45.23	10	6
2013	9	6	2	28.01	-47.04	33.48	10	5.6
2013	9	8	17	36.01	36.5	70.12	212	5.2
2013	9	9	21	41.31	1.38	122.22	23	5.6
2013	9	10	1	12.01	1.42	122.25	35	5.2
2013	9	17	4	9.31	42.14	45.81	5	5.3
2013	9	19	21	37.41	37.75	101.51	21	5
2013	9	21	1	39.55	-7.33	120.01	550	6.1
2013	9	24	7	22.09	7.37	59.54	4	5.5
2013	9	24	17	20.35	27.13	65.47	11	5.5
2013	9	28	7	34.64	27.18	65.51	12	6.8
2013	9	30	8	16.9	49.49	-28.52	10	5.5
2013	10	2	1	6.73	11.23	57.59	8	5.7
2013	10	4	17	26.36	-38.61	78.37	13	6.4
2013	10	12	13	11.33	35.51	23.25	40	6.6
2013	10	12	14	30.97	0.75	122.21	97	5.5
2013	11	3	11	3.84	4.66	123.35	532	5.9
2013	11	3	17	46.5	-57.84	-25.71	66	5.5
2013	11	8	9	51.15	-1.19	67.68	10	5.5
2013	11	13	23	45.79	-60.28	-47.12	11	6.1
2013	11	16	3	34.12	-60.26	-47.06	10	6.9
2013	11	16	9	35.62	-60.29	-46.43	10	5.5
2013	11	16	10	26.32	4.21	90.07	10	5.7
2013	11	17	17	37.41	-10.33	-11.83	10	5.5
2013	11	20	10	9.84	12.4	95.15	10	5.5
2013	11	22	6	51.5	34.46	45.48	6	5.6
2013	11	22	17	20.83	5.42	92.82	16	5.5
2013	11	22	18	30.8	34.31	45.61	14	5.8

2013	11	25	6	27.33	-53.95	-55	12	7
2013	11	28	13	51.4	29.32	51.31	8	5.8
2013	12	1	6	29.78	2.04	96.83	20	6
2013	12	22	10	3.97	-46.44	96.02	10	5.6
2013	12	28	15	21.4	36.03	31.31	41	5.9
2013	12	28	18	59.48	-1.37	-15.17	10	5.8
2013	12	31	20	1.65	19.12	120.27	11	5.7
2014	1	2	3	13.41	27.15	54.44	8	5.2
2014	1	16	21	38.01	-53.99	6.98	10	5.2
2014	1	23	0	52.53	-7.1	120.31	579	5.5
2014	1	25	5	14.85	-7.99	109.27	66	6.1
2014	1	26	18	45.71	38.23	20.41	22	5.4
2014	2	1	3	58.39	-56.83	-27.34	130	6.1
2014	2	3	3	8.61	38.26	20.39	5	6
2014	2	8	19	50.64	-60.43	-45.19	24	5.7
2014	2	10	12	6.71	40.28	48.8	64	5.4
2014	2	10	18	6.79	-8.21	124.53	19	5.5
2014	2	17	5	55.91	18.53	120.43	20	5.5
2014	3	11	2	44.58	-60.86	-19.98	10	6.4
2014	3	14	13	38.62	7.76	94.31	10	5.5
2014	3	15	2	59.81	13.76	57.11	10	5.2
2014	3	17	13	24.89	-53.17	-32.32	6	5.6
2014	3	19	20	17.35	-60.73	-25.33	10	5.5
2014	3	29	7	46.01	-0.85	-21.92	12	5.9
2014	4	1	23	13.51	-46.73	-10.5	10	5.3
2014	4	4	20	8.69	37.28	23.87	107	5.6
2014	4	15	3	57.13	-53.5	8.72	11	6.8
2014	4	17	4	38.77	4.52	122.94	573	5.8
2014	4	28	12	43.21	-32.09	57.07	15	5.3
2014	5	5	11	8.34	19.66	99.67	6	6.1
2014	5	11	12	35.74	-47.85	99.69	10	5.8
2014	5	15	10	16.2	9.38	122.06	16	6.3
2014	5	18	1	2.26	4.25	92.76	35	6
2014	5	19	22	47.29	-57.03	-25.15	10	5.7
2014	5	21	16	21.43	18.2	88.04	47	6
2014	5	22	8	37.65	-55.4	-28.28	7	5.5
2014	5	23	20	49.19	24.97	97.84	8	5.8
2014	5	23	23	41.92	45.01	-27.84	10	5.5
2014	5	24	9	25.24	40.29	25.39	6	6.9
2014	5	30	1	20.51	25	97.85	10	5.9
2014	6	1	10	7.25	2.02	89.78	20	5.7
2014	6	7	6	5.99	40.37	51.57	31	5.5

2014	6	13	19	30.96	-46.03	-13.88	6	5.8
2014	6	14	3	58.16	36.45	70.72	200	5.6
2014	6	14	11	10.98	-10.12	91.09	4	6.5
2014	6	29	7	52.51	-55.47	-28.37	8	6.9
2014	6	30	1	46.29	0.05	-17.34	10	5.6
2014	7	5	9	39.77	1.93	96.94	20	6
2014	7	14	5	5.32	-8.82	111.25	53	5.5
2014	7	19	7	17.61	71.09	36.87	83	5.2
2014	7	19	14	14.18	11.74	57.64	10	6
2014	7	23	5	52.91	67.08	0.47	10	5.3
2014	7	26	11	13.81	-60.04	-18.67	10	5.8
2014	7	27	1	28.74	23.72	-45.59	10	6
2014	7	29	7	7.71	14.36	93.09	12	5.5
2014	7	30	1	32	26.37	53.52	11	5.6
2014	7	31	13	41.11	12.43	95.24	10	5.8
2014	8	1	4	11.68	36.85	3.16	10	5.5
2014	8	2	10	33.61	9.14	67.33	10	5.5
2014	8	2	14	2.87	-55.43	-28.31	7	5.6
2014	8	18	2	32.53	32.7	47.69	10	6.2
2014	8	18	11	23.41	32.7	47.62	15	5.2
2014	8	18	18	8.27	32.58	47.7	5	6
2014	8	19	21	32.61	32.74	47.52	7	5.4
2014	8	20	10	14.57	32.64	47.74	18	5.6
2014	8	23	20	5.81	32.71	47.77	19	5.1
2014	8	31	11	48.41	36.56	70.96	200	5.2
2014	9	7	7	7.97	64.54	-17.4	5	5.5
2014	9	10	5	16.31	-0.18	125.12	30	5.9
2014	9	13	22	31.81	36	70.69	95	5.2
2014	9	15	8	5.21	64.57	17.39	10	5.5
2014	9	22	16	1.25	-56.01	-27.82	112	5.6
2014	9	25	2	31.88	27.46	65.76	52	5.5
2014	9	26	4	21.41	12.51	95.22	20	5.5
2014	9	29	1	38.81	41.19	48.1	13	5.3
2014	9	29	13	43.11	64.5	-17.31	10	5.6
2014	9	30	16	45.62	1.64	67.69	10	5.5
2014	10	3	8	5.42	11.32	122.11	19	5.5
2014	10	7	10	22.01	64.53	-17.19	4	5.5
2014	10	7	13	49.01	23.39	100.49	11	6
2014	10	15	11	16.31	64.48	-18	10	5.5
2014	10	15	13	35.27	32.52	47.78	10	5.5
2014	10	24	23	43.51	38.91	21.12	0	5.3
2014	10	28	13	13.81	-36.01	53.51	10	5.4

2014	10	30	12	11.51	-6.98	117.58	535	5.7
2014	11	8	23	15.21	38.1	20.44	18	5.1
2014	11	10	2	39.21	-23.97	69.55	10	5.2
2014	11	18	3	25.71	7.48	94.35	6	5.6
2014	11	21	8	58.41	36.51	71	234	5.2
2014	11	22	8	55.61	30.34	101.73	9	5.9
2014	11	22	13	45.61	36.52	66.58	21	5.4
2014	11	22	19	14.61	45.89	27.15	32	5.6
2014	11	25	15	19.81	30.18	101.76	9	5.6
2014	11	27	0	18.71	5.81	61.3	10	5.3
2014	11	29	13	5.81	5.73	61.38	10	5.6
2014	12	1	3	47.91	5.91	61.36	10	5.2
2014	12	1	22	47.61	1.59	67.7	10	5.4
2014	12	2	4	53.51	5.96	61.3	13	5.4
2014	12	2	5	11.11	6.15	123.12	614	6.6
2014	12	3	0	27.41	-2.93	122.42	10	5.5
2014	12	4	10	53.01	-12.06	65.56	10	5.4
2014	12	5	18	43.61	23.33	100.47	11	5.6
2014	12	6	10	20.11	23.35	100.53	10	5.6
2014	12	11	13	53.91	-56.75	-25.42	10	5.5
2014	12	17	6	10.51	-3.82	100.14	10	5.9
2014	12	18	20	10.31	-56.62	-25.37	10	5.5
2014	12	28	20	30.71	-59.8	-27.21	149	5.5
2014	12	29	17	41.91	-56.65	-24.85	19	5.6
2015	1	10	2	5.61	-5.65	68.36	10	5.6
2015	1	10	19	32.01	14.77	120.24	59	5.9
2015	1	19	17	19.51	4.6	119.75	11	5.5
2015	1	28	15	54.91	34.45	25.08	37	5.1
2015	2	1	20	2.11	-49.31	-8.12	10	5.6
2015	2	9	7	59.11	0.2	-17.12	10	5.3
2015	2	10	14	47.01	9.72	57.58	10	5.4
2015	2	13	18	59.22	52.64	-31.9	16	7.1
2015	2	16	22	0.31	-55.2	-28.25	13	6.2
2015	2	21	11	34.61	-16.84	-14.12	10	5.3
2015	2	22	11	48.41	-29.04	-3.9	10	5.1
2015	2	25	1	31.11	6.08	119.84	9	0.5
2015	2	26	21	59.51	34.67	73.27	29	5.4
2015	2	27	13	45.51	-7.29	122.53	552	7
2015	3	3	10	37.01	-0.77	98.71	28	6.1
2015	3	6	8	22.81	-41.31	80.6	10	6
2015	3	27	23	34.41	35.7	26.62	67	5.2
2015	3	28	22	28.01	0.4	121.99	118	5.9

2015	3	30	10	34.31	-39.28	78.09	10	0.5
2015	4	10	16	23.41	-13.79	65.85	10	0.5
2015	4	16	18	35.81	26.82	35.18	20	6
2015	4	19	5	32.41	-17.1	66.58	10	5.3
2015	4	25	6	45.05	28.22	84.82	10	6.6
2015	4	26	7	9.01	27.77	86.01	22	6.7
2015	4	30	10	19.81	-60.39	-26.9	10	5.8
2015	5	1	8	58.11	10.71	91.96	29	0.5
2015	5	8	3	12.11	1.54	97.9	36	5.7
2015	5	11	17	42.21	-7.75	67.82	10	5.3
2015	5	12	7	5.91	27.8	86.06	15	7.3
2015	5	15	20	26.61	-2.54	102.21	151	6
2015	5	16	11	27.61	27.56	86.07	7	0.5
2015	5	24	4	11.11	-16.85	-14.17	11	5.5
2015	5	24	21	11.11	-59.65	-26.45	34	5.5
2015	6	17	12	51.21	-35.36	-17.16	11	5.5
2015	6	29	22	7.81	36.68	71.3	19	5.5
2015	7	26	7	5.01	-92.58	111.26	52	5.5
2015	8	10	10	5.51	36.53	71.21	224	5.5
2015	8	14	18	3.21	21.1	-45.85	11	5.5
2015	9	30	16	11.11	-56.19	-27.71	111	5.5
2015	10	10	8	11.11	-60.72	-20.84	11	5.5
2015	10	19	13	50.11	13.86	120.61	106	5.8
2015	10	23	4	4.81	-45.81	37.17	11	5.5
2017	2	7	22	3.64	25.191	63.264	29	6.3
2017	3	2	11	7.69	37.616	38.431	10	5.6
2017	3	7	15	45.95	-6.261	102.187	10	5.5
2017	3	14	2	51.67	6.146	92.304	10	6
2017	3	16	18	39.62	-11.539	114.574	10	5.5
2017	3	21	23	10.51	-8.492	115.323	111	5.6
2017	3	31	11	21.1	0.309	120.58	94	5.5
2017	4	4	13	53.9	-55.616	-30.001	19	5.6
2017	4	5	6	9.22	35.776	60.436	13	6.1
2017	4	8	7	7.66	13.705	120.93	10	5.5
2017	4	8	7	9.32	13.77	120.935	14	5.9
2017	4	11	21	21.08	7.677	124.812	8	5.8
2017	4	12	20	1.56	7.723	124.862	10	5.5
2017	4	16	9	44.58	-7.372	83.172	10	5.6
2017	4	29	10	2.25	-9.669	111.85	10	5.5
2017	5	2	15	10.24	-11.712	-13.938	10	5.9
2017	5	3	4	47.34	39.494	71.444	11	6
2017	5	5	5	9.59	39.479	71.422	10	5.8

2017	5	10	23	23.68	-56.414	-25.743	15	6.5
2017	5	11	1	9.3	-56.397	-25.787	10	5.6
2017	5	11	15	41.16	-56.584	-25.844	13	5.7
2017	5	13	18	0.95	37.769	57.206	8	5.6
2017	5	20	1	6.42	9.382	123.954	533	6
2017	5	24	9	10.43	-2.79	122.118	10	5.7
2017	5	29	14	35.15	-1.292	120.431	12	6.6
2017	5	30	11	29.18	-58.628	-26.242	76	5.7
2017	6	11	23	15.61	-8.321	106.259	7	5.7
2017	6	12	12	28.91	38.93	26.365	12	6.3
2017	6	25	3	1.91	-9.54	66.17	10	5.6
2017	6	30	1	34.81	33.741	-38.544	10	5.9
2017	7	6	8	3.75	11.127	124.629	9	6.5
2017	7	10	1	41.82	10.989	124.784	7	5.8
2017	7	15	12	12.15	0.41	121.984	113	5.9
2017	7	19	12	16.35	-17.415	66.484	10	6
2017	7	20	22	31.12	36.929	27.414	7	6.6
2017	7	27	17	53.46	13.396	-49.326	10	6
2017	8	8	13	19.95	33.193	103.855	9	6.5
2017	8	8	23	27.31	44.302	82.832	20	6.3
2017	8	11	5	28.58	14.007	120.739	172	6.2
2017	8	13	3	8.05	-3.768	101.623	31	6.4
2017	8	18	2	59.56	-1.112	-13.661	35	6.6
2017	9	1	11	7.7	57.058	-34.071	10	5.5
2017	9	4	8	7.45	-57.739	-25.613	25	6.1
2017	9	10	21	40.06	57.132	-33.652	10	5.7
2017	9	15	18	48.25	-55.444	-28.362	9	5.5
2017	9	18	5	28.3	-18.546	-12.696	10	5.5
2017	9	20	23	59.49	-6.111	113.024	588	5.7
2017	10	3	20	39.47	13.459	-49.332	10	5.7
2017	10	10	18	53.78	-54.263	8.609	9	6.7
2017	10	11	0	8.63	-54.259	8.336	10	5.6
2017	10	23	8	32.25	-52.344	16.781	10	5.8
2017	10	24	10	47.78	-7.217	123.073	553	6.7
2017	10	28	16	13.44	86.875	54.151	10	5.8
2017	10	28	16	16.69	86.897	53.211	10	5.8
2017	10	28	19	11.27	86.923	55.2	10	5.9
2017	11	11	0	36.5	-11.742	-14.114	10	6.1
2017	11	12	18	18.72	34.911	45.959	19	7.3
2017	11	17	22	34.94	29.833	94.984	8	6.4
2017	11	28	13	15.54	72.599	3.275	10	5.5
2017	11	30	6	32.07	-1.08	-23.432	10	6.5

2017	12	1	2	32.6	30.746	57.307	9	6.1
2017	12	1	5	20.85	-48.779	106.825	10	5.5
2017	12	6	16	6.7	-0.63	123.668	28	5.5
2017	12	12	8	43.83	30.737	57.279	12	6
2017	12	12	21	41.11	30.828	57.298	8	6
2017	12	13	18	3.39	-54.219	2.163	17	6.5
2017	12	15	16	47.82	-7.492	108.174	90	6.5
2017	12	25	12	2.95	-27.885	74.005	10	5.5
2018	1	7	6	47.58	24.738	94.906	33	5.6
2018	1	11	6	59.04	33.713	45.724	10	5.5
2018	1	11	18	26.42	18.372	96.072	9	6
2018	1	23	6	34.5	-7.092	105.963	48	5.9
2018	1	25	1	15.83	8.253	91.766	10	5.8
2018	1	28	16	3.39	-53.062	9.684	10	6.6
2018	1	31	7	7.03	36.526	70.851	193	6.2
2018	2	4	13	24.26	82.986	-6.456	10	5.5
2018	2	6	15	50.33	24.134	121.659	17	6.4
2018	2	7	15	21.17	24.074	121.739	15	5.7
2018	2	8	2	29.69	79.764	2.941	10	5.7
2018	3	10	14	27.26	-56.364	-27.864	10	5.5
2018	3	10	21	45.63	-1.423	-15.21	10	5.9
2018	3	17	5	50.9	-47.679	-13.509	10	5.7
2018	3	24	19	58.34	-45.778	96.069	10	6
2018	4	9	0	20.55	-57.659	-27.899	245	5.6
2018	4	19	6	34.68	28.329	51.611	10	5.5
2018	4	19	21	9.7	-42.78	42.188	10	6
2018	4	29	22	23.59	-39.265	46.12	10	5.9
2018	5	5	6	19.5	14.571	123.919	18	6.1
2018	5	9	10	41.59	36.994	71.382	116	6.2
2018	5	10	18	2.89	6.87	123.762	535	5.9
2018	5	14	18	14.74	-55.916	-27.056	10	5.5
2018	6	6	18	51.45	-58.36	-25.756	31	5.6
2018	6	12	23	8.84	-2.02	98.588	9	5.9
2018	7	10	10	26.23	-31.599	58.346	10	5.6
2018	7	10	16	5.87	-31.592	58.152	10	5.6
2018	7	22	10	7.14	34.591	46.166	12	5.8
2018	7	22	20	39.74	30.431	57.453	10	5.6
2018	7	23	10	35.96	-0.299	-19.252	10	6
2018	7	25	19	45.5	-56.062	-27.681	124	5.7
2018	7	28	17	7.33	-7.104	122.726	578	6
2018	7	28	22	47.87	-8.239	116.508	14	6.4
2018	8	5	11	46.86	-8.258	116.438	34	6.9

2018	8	7	13	57.98	74.646	8.455	10	5.7
2018	8	9	5	25.92	-8.306	116.23	15	5.9
2018	8	9	16	53.76	-33.354	2.482	10	5.6
2018	8	14	3	29.21	-58.134	-25.273	25	6.1
2018	8	17	15	35.19	-7.372	119.802	529	6.5
2018	8	19	4	10.26	-8.337	116.599	16	6.3
2018	8	19	14	56.74	-8.319	116.627	21	6.9
2018	8	22	20	26.9	-52.734	27.901	10	5.6
2018	8	25	18	33.56	-8.422	116.926	11	5.5
2018	8	25	22	13.56	34.611	46.242	10	6
2018	8	31	14	40.24	13.557	120.843	116	5.5
2018	9	1	6	13.5	-28.98	74.559	10	5.5
2018	9	7	6	23.54	28.326	59.32	10	5.6
2018	9	18	7	27.13	-37.813	49.776	10	6
2018	9	28	6	21.49	-26.493	67.589	10	5.6
2018	9	28	6	59.82	-0.401	119.77	4	6.1
2018	9	28	7	6.98	-26.513	67.62	10	5.7
2018	9	28	10	2.5	-0.256	119.846	20	7.5
2018	10	2	0	16.57	-10.475	120.143	26	5.9
2018	10	2	4	49.12	-10.472	120.119	17	5.7
2018	10	10	18	44.27	-7.452	114.455	9	6
2018	10	21	1	40.79	-29.536	60.752	10	5.8
2018	10	23	4	34.86	24.115	122.603	30	5.8
2018	10	23	16	4.42	23.991	122.679	31	5.7
2018	10	25	22	54.26	37.52	20.556	14	6.8
2018	10	28	0	38.83	45.657	26.397	151	5.5
2018	11	1	19	30.09	-58.074	-25.206	29	5.8
2018	11	4	7	55.92	7.76	123.867	600	6
2018	11	9	1	49.37	71.631	-11.243	10	6.7
2018	11	9	7	54.25	-42.713	-16.02	10	5.7
2018	11	11	14	3.9	15.565	-49.872	10	6.3
2018	11	14	23	1.1	-2.907	119.392	14	5.5
2018	11	15	16	49.16	-56.815	-25.572	10	5.5
2018	11	15	20	2.29	-56.706	-25.546	15	6.4
2018	11	17	13	17.23	15.54	-49.907	10	5.5
2018	11	23	10	51.85	-56.282	-26.925	76	5.6
2018	11	25	16	37.28	34.361	45.744	18	6.3
2018	11	27	12	3.73	-0.942	-13.828	10	5.7
2018	11	29	20	21.46	0.225	96.998	9	5.8
2018	12	11	2	26.94	-58.538	-26.396	133	7.1
2018	12	16	14	26.96	-23.323	112.498	10	5.8
2018	12	23	19	32.2	30.408	87.62	10	5.8

2018	12	30	8	39.24	-2.677	102.349	166	5.7
1985	8	29	23	39.88	39.44	75.45	17	5.2
1985	8	30	20	27.07	16.98	119.94	28	5.4
1985	9	1	19	7.22	23.77	102.74	10	5.1
1985	9	1	22	25.41	0.67	121.43	83	5.1
1985	9	3	23	32.75	1.41	128.15	113	5.7
1985	9	5	3	53.2	-7.36	128.47	142	5.3
1985	9	7	0	22.15	-3.08	130.35	26	5.6
1985	9	7	4	40	-3.14	130.28	24	5.5
1985	9	7	10	20.02	37.44	21.24	31	5.4
1985	9	11	20	45.95	39.36	75.41	15	6.5
1985	9	11	22	7.07	13.59	120.89	135	4.9
1985	9	15	22	58.26	-10.81	119.3	39	5.4
1985	9	18	0	10.48	31.63	49.45	33	5.2
1985	9	24	20	28.24	-6.41	130.04	146	5.6
1985	9	27	16	39.87	34.51	26.6	61	5.6
1985	9	28	14	50.52	41.58	22.25	7	5.3
1985	10	2	21	31.64	36.47	70.14	216	4.8
1985	10	3	18	7.82	36.5	71.6	80	5.4
1985	10	9	1	15.46	-6.79	107.08	153	5.9
1985	10	13	15	59.12	40.3	69.82	16	5.9
1985	10	19	20	51.08	10.46	125.16	42	5.3
1985	10	23	0	49.11	-11.11	125.16	13	6
1985	10	25	6	47.47	-9.2	105.6	10	5.4
1985	10	25	18	12.95	-7.08	124.28	595	5.9
1985	10	27	19	34.71	36.46	6.76	10	5.9
1985	10	29	5	19.64	-5.71	103.11	33	5.2
1985	10	29	13	13.46	36.68	54.75	52	6
1985	11	2	15	53.77	-0.01	123.88	118	5
1985	11	3	4	23.06	0.29	121.97	157	5.1
1985	11	4	21	23.88	13.67	120.19	77	5.4
1985	11	6	8	15.96	-58.72	-26.22	132	5.7
1985	11	7	8	26.14	40.31	42.31	33	5.1
1985	11	8	8	38.46	6.63	124.16	45	5.1
1985	11	9	12	56.21	-9.82	123.74	26	5.5
1985	11	9	23	30.29	41.26	23.99	22	5.4
1985	11	10	19	40.4	-29.01	-13.16	10	5.5
1985	11	14	2	11.56	-28.91	-13.11	10	5.3
1985	11	15	10	35.72	-47.23	-13.39	10	5.2
1985	11	16	1	56.31	-47.14	-13.4	10	5.2
1985	11	16	4	12.88	-38.58	78.37	10	6.6
1985	11	18	18	18.47	-32.3	-13.36	10	5.5

1985	11	19	14	3.46	28.67	128.88	134	5.5
1985	11	20	2	49.48	-10.45	111.82	33	5.1
1985	11	21	2	27.87	2.37	126.73	67	5.4
1985	11	21	21	57.49	41.7	19.39	24	5.5
1985	11	24	21	32.18	-59.45	-24.84	37	5.3
1985	11	25	16	26.04	-8.65	108.5	67	5.1
1985	11	26	0	27.42	22.57	121.95	26	5
1985	11	26	10	5.35	24.14	125.18	20	5.9
1985	11	30	2	28.15	-29.24	61.25	10	5.6
1985	12	9	11	58.8	-5.65	105.82	148	5.1
1985	12	14	6	46.17	3.68	126.6	22	6.1
1985	12	17	0	13.98	-36	53.51	10	5.2
1985	12	17	0	49.49	-36.02	53.46	10	5.4
1985	12	17	14	47	3.75	126.65	33	4.9
1989	11	24	0	35.76	0.99	126.01	25	5.7
1989	12	3	11	11.63	-8.83	113.42	95	5.6
1989	12	7	12	59.35	25.92	58.97	15	5.7
1989	12	8	0	4.54	21.18	93.75	47	5.6
1989	12	8	10	23.25	10.09	126.5	43	5.9
1989	12	9	20	38.85	0.14	123.34	151	6.8
1989	12	12	8	33.62	-4.68	130.83	74	5.8
1989	12	15	20	44.72	8.12	126.8	42	5.3
1989	12	16	0	33.66	8.43	126.94	36	5.4
1989	12	16	0	53.5	8.4	126.85	29	5.5
1989	12	16	2	40.74	-3.61	131.18	25	5.5
1989	12	16	20	55.71	34.58	57.52	33	4.5
1989	12	17	3	12.8	-8.49	92.23	24	5.4
1989	12	17	14	34.55	8.55	126.79	39	5.6
1989	12	18	7	13.1	0.94	-28.98	10	5.7
1989	12	20	0	8.06	8.09	126.83	21	6.3
1989	12	20	8	35.03	8.19	126.85	39	5.8
1989	12	21	8	8.46	3.25	96.4	21	5.6
1989	12	27	4	19.38	0.96	126.13	62	5.1
1989	12	27	20	1.52	-4.44	102.96	65	5.4
1990	1	2	1	25.65	8.34	127.44	40	5.4
1990	1	2	21	38.86	-2.55	127.71	34	5.4
1990	1	5	10	10.18	-8.8	106.44	29	5.8
1990	1	6	21	44.62	-10.68	92.99	14	5.7
1990	1	7	20	53.92	-32.16	57.45	10	5.3
1990	1	9	2	29.66	28.23	88.16	79	5.5
1990	1	9	15	35.9	11.59	95.02	33	5.3
1990	1	9	18	51.92	24.75	95.24	119	6.1

1990	1	10	6	37.48	24.52	94.68	86	5.2
1990	1	10	10	6.15	-52.19	13.51	10	5.5
1990	1	10	11	53.16	11.65	95.14	33	5.4
1990	1	10	16	11.67	-10.07	123.82	32	5.6
1990	1	11	21	14.78	35.79	80.76	10	5.3
1990	1	12	15	28.47	4.98	126.51	61	5.4
1990	1	20	1	27.98	35.83	52.95	24	5.9
1990	1	21	16	52.4	34.42	70.56	33	4.5
1990	1	22	17	26.14	3.88	96.1	45	6
1990	1	24	19	33.11	14.6	119.44	23	5.8
1990	2	22	16	51.1	-11.46	66.38	12	5.7
1990	2	24	19	13.48	-15.52	-175.24	33	6
1990	2	26	19	6.64	-26.65	-114.73	14	6.1
1990	3	4	17	21.9	-15.54	167.57	141	5.4
1990	3	5	20	51.3	36.74	73.06	10	5.7
1990	3	5	23	4.21	36.77	73.03	20	5
1990	3	6	18	7.47	36.91	73.04	19	5
1990	3	12	14	41.94	51.48	-175.03	13	6.5
1990	3	13	1	4.04	-16.61	-172.53	29	5.2
1990	3	14	3	44.96	4.57	122.62	639	5.6
1990	3	15	4	56.45	-15.13	167.24	132	5.6
1990	3	26	22	47.67	9.25	125.61	39	5.6
1990	4	3	22	57.09	11.43	-86.3	52	6.7
1990	4	6	6	9.3	-15.15	-172.13	33	5.7
1990	4	9	2	49.41	22.88	121.4	36	4.7
1990	4	10	22	44.41	-10.52	109.59	39	5.3
1994	5	24	2	5.62	38.66	26.54	17	5.5
1994	5	25	14	31.26	-0.26	-16.46	10	5.2
1994	5	25	18	42.93	7.65	94.28	24	5.9
1994	5	29	14	11.09	20.56	94.16	35	6.5
1994	6	2	18	17.4	-10.48	112.83	18	7.8
1994	6	3	4	54	-10.39	113	42	5.6
1994	6	3	18	16.9	-10.47	112.96	40	5.6
1994	6	3	21	6.98	-10.36	112.89	25	6.6
1994	6	3	22	40.12	28.74	70.07	33	5.9
1994	6	3	23	2.05	-10.4	113.59	23	5.6
1994	6	4	3	32.25	-12.06	111.96	60	5.3
1994	6	4	5	17.76	-11.38	112.85	40	5.3
1994	6	4	11	18.3	-10.79	113.34	30	5.2
1994	6	4	12	4.78	-10.7	113.56	28	5.2
1994	6	4	20	9.47	-10.83	113.2	30	5.5
1994	6	5	1	9.01	24.51	121.9	11	6.4

1994	6	5	5	32.36	-10.83	113.45	39	5.2
1994	6	5	17	51.7	-10.65	112.65	39	5.5
1994	6	5	18	30.51	-10.68	112.42	35	5.2
1994	6	6	1	8.12	-10.81	113.32	34	5.3
1994	6	6	2	18.65	-10.52	113.41	21	5.1
1994	6	6	5	32.48	-10.59	112.62	20	5.1
1994	6	7	18	31.2	-5.79	104.44	41	5.4
1994	6	9	16	22.2	13.26	124.28	75	6.2
1994	6	9	20	36	36.94	71.32	87	5.4
1994	6	10	3	0.45	38.56	70.63	33	5.4
1994	6	10	6	25.78	41.53	88.71	0	5.8
1994	6	10	19	11.66	-10.39	112.73	28	5.3
1994	6	12	1	35.14	-10.46	112.83	33	5.1
1994	6	12	13	53.75	-10.61	112.6	34	5.3
1994	6	13	21	4.94	-10.28	113.49	23	5.6
1994	6	13	22	48.75	-10.33	113.62	25	5.6
1994	6	14	2	35.78	-10.68	113.31	32	5.1
1994	6	14	14	15.76	-3.69	68.42	10	5
1994	6	14	15	20.12	-10.51	113.48	27	5.2
1994	6	14	16	0.18	-10.49	113.51	33	5.1
1994	6	14	21	1.54	1.52	126.31	33	5.6
1994	6	15	9	22.72	-10.34	113.66	19	6.2
1994	6	15	10	28.06	-10.17	113.75	28	6.1
1994	6	15	12	10.64	-10.5	113.44	24	5.2
1994	6	17	5	15.09	14.47	54.53	10	5
1994	6	18	12	42.03	28.97	52.67	11	5.1
1994	6	18	22	38.9	-10.15	113.63	46	5.5
1994	6	19	3	20.61	-9.47	112.76	33	5.3
1994	6	19	12	57.12	-10.35	113.48	33	5.3
1994	6	20	9	9.29	28.97	52.61	8	5.9
1994	6	22	19	11.45	-10.56	112.64	33	5.1
1994	6	26	1	22.25	-37.39	47.72	10	5
1994	6	26	6	14.62	-10.77	113.31	33	5
1994	6	27	12	3.3	-16.12	67.48	10	5.4
1994	6	29	18	22.35	32.57	93.67	9	5.9
1994	7	1	10	12.12	40.23	53.38	40	5.6
1994	7	1	19	50.43	40.22	53.39	44	5.2
1994	7	3	21	44.46	-48.22	31.54	10	5.4
1994	7	5	10	9.26	10.43	125.32	29	5.9
1994	7	5	13	31.72	-12.15	65.67	10	5.5
1994	7	8	17	10.42	0.26	66.74	10	5.4
1994	7	8	20	32.95	-28.85	75.31	10	5.2

1994	7	12	22	40.44	-6.2	105.44	33	5
1994	7	18	16	33.98	-9.59	112.94	33	5.5
1994	7	19	16	18.48	10.2	125.19	20	5.3
1994	7	23	4	38.35	-1.03	97.47	31	5.1
1994	7	23	20	57.9	31.07	86.55	15	5.4
1994	7	24	10	59.06	-4.11	102.78	82	5.4
1994	7	25	4	39.74	-56.97	-25.5	33	5.6
1994	7	31	5	15.95	32.56	48.37	43	5.6
1994	7	31	14	44.31	-60.69	-24.86	33	5.3
1994	8	3	2	25.98	12.45	-43.98	10	5
1994	8	6	21	2.46	26.99	54.36	16	5.3
1994	8	7	5	52.76	-10.27	119.98	25	5.2
1994	8	10	1	39.96	10.52	94.36	33	5.4
1994	8	11	6	46.24	27.03	54.47	24	5.2
1994	8	18	1	13.57	35.52	-0.11	8	5.9
1994	8	19	21	2.56	17.97	96.42	12	5.8
1994	8	21	15	55.92	56.76	117.9	12	6
1994	8	22	12	41.65	70.92	-6.1	10	5.3
1994	8	24	15	17.03	-25.08	-13.59	10	5.3
1994	8	29	17	36.08	-0.4	-19.17	10	5.8
1994	8	31	4	19.39	49.48	94.21	33	5
1994	9	1	11	28.6	-24.91	-13.66	10	5.2
1994	9	1	16	12.07	41.18	21.2	14	5.6
1994	9	3	3	43.9	-27.87	76.13	10	5.1
1994	9	4	14	50.43	35.94	100.08	10	5.2
1994	9	7	13	56.52	38.49	90.35	33	5.2
1994	9	8	8	50.23	0.54	126.17	52	5.7
1994	9	8	13	33.68	28.03	61.84	77	5.1
1994	9	12	11	30.49	-8.91	106.48	33	5.7
1994	9	15	7	7.84	23.71	121.96	49	5.2
1994	9	16	6	20.87	22.53	118.71	13	6.8
1994	9	20	5	51.6	32.5	48.77	33	5.2
1994	9	23	19	15.44	36.04	100.15	33	5.3
1994	9	28	21	22.08	-4.71	102.2	46	5.5
1994	10	5	1	13.73	23.1	121.48	69	5.5
1994	10	11	23	13.87	-6.97	102.76	30	5.2
1994	10	19	17	55.36	22.43	118.71	15	5
1994	10	25	4	37.5	1.83	126.02	40	5.5
1994	10	25	9	19.56	-55.9	-27.9	33	5.2
1994	10	28	23	51.22	24.76	122.21	33	5.6
1994	10	31	11	48.39	3.02	96.19	29	6.2
1994	11	2	1	43.55	5.1	118.64	55	5.7

1994	11	10	7	7.43	22.36	118.8	33	5.1
1994	11	13	9	7.21	-0.22	124.42	35	5.2
1994	11	14	11	27.61	-0.03	-16.93	10	5.3
1994	11	14	19	15.06	13.52	121.07	31	7.1
1994	11	15	6	25.92	13.14	121.18	21	5.5
1994	11	15	23	59.45	22.39	118.77	13	5.2
1994	11	16	21	34.2	-10.18	-13.26	10	5.3
1994	11	18	1	13.02	13.06	121.09	19	5.4
1994	11	27	18	27.8	5.77	119.32	27	5.5
1994	11	29	19	48.81	-36.49	-1.55	10	5.3
1994	12	7	23	8.75	-2.95	119.83	28	5.3
1994	12	8	8	30.68	1.97	120.84	38	5.7
1994	12	10	12	16.11	27.91	64.99	56	5.2
1994	12	12	14	52.33	-9.98	119.2	25	5.6
1994	12	12	21	49.57	-38.98	46.59	10	5.4
1994	12	14	20	43.37	35.1	58.63	33	5.3
1994	12	21	11	22.15	22.41	118.65	15	5.1
1994	12	28	3	56.71	35.83	90.74	33	5.2
1994	12	29	18	58.04	29.08	103.79	33	5.1
1994	12	31	2	57.08	20.52	109.33	33	5.3
1995	1	3	16	11.7	-57.7	-65.88	13	5.9
1995	1	6	18	1.28	-56.5	-25.32	33	5.5
1995	1	6	19	1.1	-56.63	-25.72	33	5.4
1995	1	10	7	55.03	23.62	121.66	33	5.2
1995	1	10	10	9.1	20.2	109.15	33	5.5
1995	1	15	1	19.71	-5.81	102.83	35	5.1
1995	1	20	15	49.22	1.18	126	56	5.9
1995	1	26	7	0.5	36.15	71.25	106	5.2
1995	1	29	1	20.08	36.92	71.64	109	5.3
1995	2	1	14	26.46	-42.42	-18.46	10	5.5
1995	2	4	17	25.16	-13.91	66.08	10	5.5
1995	2	17	2	44.5	27.64	92.37	39	5.5
1995	2	20	2	59.27	-27.77	76.17	10	5.5
1995	2	20	4	12.32	39.17	71.12	25	5.3
1995	2	20	8	7.42	41.07	72.45	39	5.1
1995	2	23	21	3.13	35.05	32.28	10	5.9
1995	2	26	15	3.33	1.29	97.88	53	5.4
1995	3	4	17	56.8	-13.97	-14.49	10	5.4
1995	3	6	18	43.01	2.69	118.23	16	6.1
1995	3	9	7	4.21	78.3	2.3	10	5.1
1995	3	9	18	36.61	20.94	121.97	33	5.4
1995	3	14	6	27.75	19.03	121.38	33	5.2

1995	3	14	10	27.07	3.05	95.85	30	5.5
1995	3	15	2	31.19	15.06	118.65	26	5.4
1995	3	18	18	2.66	42.42	87.2	21	5.4
1995	3	20	8	14.19	-8.01	116.49	231	5.8
1995	3	23	17	51.48	15.55	-46.72	10	5.1
1995	4	3	11	54.35	24.07	122.29	33	5.7
1995	4	4	7	10.56	33.75	-38.62	10	5.8
1995	4	6	20	47.89	10.93	125.97	38	5.4
1995	4	7	10	2.02	-56.7	-26.73	90	5.5
1995	4	9	4	44.02	21.8	121.14	36	5.2
1995	4	9	6	35.39	0.02	126.55	53	5.4
1995	4	13	4	16.79	-0.59	124.26	32	5.6
1995	4	13	19	2.83	-0.67	124.23	33	5.2
1995	4	14	13	15.73	-60.77	-20.07	10	6.5
1995	4	17	7	14.52	33.76	-38.58	10	6.2
1995	4	17	8	52.08	-55.66	-27.42	33	5.5
1995	4	21	0	2.84	11.97	125.69	27	6
1995	4	21	3	5.14	12.12	125.67	25	5.1
1995	4	21	5	17.13	12.05	125.92	27	6.8
1995	4	22	0	21.86	30.89	49.91	25	5.3
1995	4	23	5	8.19	12.39	125.4	24	6.8
1995	4	23	7	21.96	12.39	125.52	28	5.4
1995	4	23	20	28.76	12.37	125.46	27	5.3
1995	4	24	6	8.85	12.23	125.84	30	5.5
1995	4	24	17	4.53	12.48	125.39	24	5.7
1995	4	25	8	29.25	22.67	120.69	41	5.1
1995	4	25	9	12.62	12.37	125.35	24	5.6
1995	4	27	15	59.26	-42.49	-18.7	10	5.1
1995	4	29	9	43.77	11.85	125.98	15	6.1
1995	4	30	1	9.72	11.9	125.98	42	5.1
1995	5	1	0	29.05	-0.31	120.94	47	5.2
1995	5	2	11	48.16	43.78	84.66	33	5.5
1995	5	4	0	34.91	40.57	23.62	10	5.3
1995	5	4	15	0.03	19.62	122.13	33	5.2
1995	5	5	3	53.5	12.63	125.3	16	7.1
1995	5	5	4	39.06	12.64	125.24	33	6.1
1995	5	5	13	1.14	-9.9	118.92	33	5.7
1995	5	5	17	19.93	-8.73	111.03	76	5.9
1995	5	6	2	56.79	12.66	125.21	33	5.1
1995	5	8	19	36.04	11.54	126	33	5.1
1995	5	9	16	10.74	7.35	123.75	33	5.1
1995	5	10	19	1.24	-8.33	112.91	142	5

1995	5	13	7	28.01	-14.02	-14.25	10	5
1995	5	13	8	47.27	40.15	21.69	14	6.6
1995	5	14	11	33.88	-8.38	125.13	11	6.9
1995	5	14	22	33.72	39.79	77.58	33	5.1
1995	5	15	4	5.78	41.6	88.82	0	6.1
1995	5	15	15	26.39	-56.04	-27.81	100	5.2
1995	5	17	4	14.52	40.1	21.63	18	5.1
1995	5	17	9	45.73	39.99	21.56	10	5
1995	5	18	0	6.74	-0.89	-22	12	6.8
1995	5	19	6	48.96	40.07	21.56	10	5.1
1995	5	19	21	30.64	-1.02	120.5	25	5.9
1995	5	23	22	10.18	-55.94	-3.36	10	6.8
1995	9	3	23	32.75	1.41	128.15	113	5.7

A-5: S-wave Model Event List

Table **A-5**: Table of details for events used in S-wave model.

Year	Month	Day	Hour	Min	Latitude	Longitude	Depth (km)	Magnitude
2001	3	31	2	26.34	4.05	96.09	50	5.1
2001	4	15	22	38.67	-34.07	56.94	10	5
2001	4	17	5	5.63	51.44	19.26	5	4.6
2001	4	17	21	45.85	-4.39	101.68	33	5
2001	4	18	12	6.01	-55.65	-29.42	33	5
2001	7	12	6	12.67	-7.43	-13.38	10	5.7
2001	7	13	19	48.92	28.75	-43.44	10	5.7
2001	7	16	14	9.92	79.51	4.19	10	5.2
2001	7	16	16	7.8	33.01	73.12	50	5.1
2001	7	23	12	9.23	0.29	98.54	33	5.1
2001	7	24	11	40.39	37.31	72.07	178	5.1
2001	7	25	16	2.2	33.17	95.6	33	5.5
2001	7	26	0	21.69	39.06	24.24	10	6.5
2001	7	28	11	20.86	0.97	-26.44	10	5
2001	7	30	19	50.92	-3.29	-12.18	10	5.2
2001	7	30	21	56.91	-4.21	102.18	33	5
2001	7	31	9	43.14	-5.28	103.34	33	5.7
2001	7	31	16	41.09	8.02	117.47	33	5.5
2001	8	1	9	20.87	71.08	-13.03	10	5
2001	8	2	8	45.53	-9.2	122.07	33	5.1
2001	8	6	2	30.29	21.49	121.07	33	5
2001	8	7	3	22.58	-8.61	113.83	90	5.6
2001	8	7	21	21.65	26.43	96.35	111	4.5
2001	8	8	18	7.99	-56	-27.68	115	5.3
2001	8	9	13	20.74	-7.35	120.72	33	5.4
2001	8	12	10	27.06	-6.96	125.17	553	5
2001	8	16	18	50.89	-36.71	78.67	10	5.5
2001	8	22	15	58.18	47.16	70.2	33	5.3
2001	8	26	0	41.31	40.95	31.57	7	5.4
2001	8	26	3	49.81	-8.54	117.63	127	5
2001	8	28	19	40.79	38.06	72.8	130	5.2
2001	9	6	5	17.81	10.08	126.01	33	5
2001	9	7	2	45.05	-13.17	97.3	10	5.9
2001	9	13	1	27.72	-3.18	101.44	73	5.2
2001	9	16	2	0.73	37.24	21.87	10	5.5

2001	9	17	22	44.22	23.2	120.76	5	5
2001	9	20	2	1.18	-11.38	115.04	10	5.6
2001	9	25	14	56.42	11.96	80.21	10	5.2
2001	9	28	4	37.62	33.26	75.74	33	4.9
2001	10	2	1	10.01	-9.16	121.82	33	5
2001	10	7	3	44.15	-3.5	126.84	33	5
2001	10	7	12	12.6	-0.28	125.02	33	5.1
2001	10	12	9	34.58	3.25	96.12	35	5
2001	10	13	16	15.08	17.11	-60.23	50	4.6
2001	10	13	16	27	0.84	125.98	33	6
2001	10	14	1	10.56	-8.6	110.63	67	5.8
2001	10	16	19	52.83	4.22	126.6	33	5.2
2001	10	18	17	31.75	2.04	126.57	33	4.3
2001	10	19	3	28.44	-4.1	123.91	33	7.5
2001	10	19	7	4.38	21.07	93.65	39	5
2001	10	19	17	43.2	-33.71	120.67	10	5.2
2001	10	19	21	42.72	-4.56	124	33	5.3
2001	10	20	19	17.22	-4.56	123.89	28	5.5
2001	10	21	3	40.82	1.83	126.51	33	5.7
2001	10	21	19	2.07	-4.86	123.92	33	5.7
2001	10	23	0	40.49	3.63	126.66	33	5.4
2001	10	23	23	22.08	-43.94	-16.05	10	5.4
2001	10	26	14	9.17	-26.15	70.89	10	5.5
2001	10	27	5	35.97	26.32	100.65	10	5.6
2001	10	28	22	31.99	-5.23	102.52	33	5
2001	10	29	2	52.17	1.59	126.61	33	5.2
2001	10	29	18	4.49	-4.98	102.08	33	5
2001	11	5	17	11.78	-17.81	64.94	10	5
2001	11	5	20	53.77	-8.18	123.87	33	5
2001	11	8	17	42.53	-27.76	65.66	10	5.2
2001	11	8	22	57.52	-60.8	-25.65	33	5.6
2001	11	9	5	36.98	53.1	-35.15	10	5.4
2001	11	10	0	37.46	24.82	122.72	33	5.1
2001	11	11	18	37.02	-5.76	124.42	600	5.1
2001	11	18	21	45.4	35.69	93.75	10	4.8
2001	11	18	21	59.25	35.73	93.69	10	5.6
2001	11	18	22	2.55	35.71	93.69	10	5.4
2001	11	18	23	49.62	18.49	121.15	33	5.4
2001	11	19	17	45.34	35.76	93.67	10	5.4
2001	11	20	8	33.29	6.43	126.86	170	5
2001	11	22	10	34.54	13.68	120.64	79	5.3
2001	11	23	20	43.35	36.39	71.51	106	6.1

2001	11	24	2	42.96	23.61	70.41	10	4.6
2001	11	24	2	56.88	25.08	125.26	73	5.1
2001	11	25	14	31.77	23.03	125.36	10	5.6
2001	11	25	21	30.43	28.32	57.27	40	5
2001	11	26	5	3.1	34.82	24.28	33	5.3
2001	11	27	7	31.23	29.61	81.75	33	5.5
2001	11	27	8	53.4	29.55	81.75	33	5.4
2001	11	27	17	56.51	29.51	81.74	33	5.1
2001	11	28	17	58.53	-0.02	123.09	145	5
2001	11	30	15	22.59	-1.2	119.92	38	5.2
2001	12	1	5	9.34	-4.76	101.9	58	5.6
2001	12	1	12	25.9	35.58	93.93	10	5.1
2001	12	2	22	41.37	27.15	88.17	33	5.1
2001	12	4	7	19.25	3.72	97.79	139	5.1
2001	12	4	18	9.66	18.96	120.24	33	5.6
2001	12	5	7	46.78	-52.61	18.35	10	5.7
2001	12	6	11	59.71	-59.9	-26.34	33	5.1
2001	12	8	4	12.47	35.73	92.77	10	5.3
2001	12	8	6	44.2	80.85	0.77	10	5.3
2001	12	9	18	15.02	0	122.87	156	6.1
2001	12	12	14	2.5	-42.81	124.69	10	7.1
2001	12	13	13	50.63	27.04	-44.5	10	5.7
2001	12	13	23	12.22	-53.44	24.86	10	5.2
2001	12	14	5	8.02	13.65	120.69	74	5
2001	12	14	7	35.25	-53.39	24.72	10	5.5
2001	12	14	10	58.59	-53.43	24.95	10	5.3
2001	12	18	4	2.82	23.95	122.73	14	6.8
2001	12	18	5	13.38	23.95	122.82	10	5.3
2001	12	20	12	1.4	-56.9	-25.02	33	5.5
2001	12	22	21	40.59	24.07	122.69	10	5.2
2001	12	28	0	10.81	-11.42	117.11	33	5
2002	1	1	11	29.27	6.3	125.65	138	6.3
2002	1	1	21	25	-27.87	74.01	10	5.1
2002	1	1	23	13.45	-27.94	74.16	10	5.1
2002	1	3	0	54.55	-4.33	102.04	33	5.6
2002	1	3	7	5.76	36.09	70.69	129	6.2
2002	1	4	15	9.89	1.95	97.92	42	5.2
2002	1	5	2	29.81	0.61	123.6	273	5.2
2002	1	7	19	13.51	-4.04	101.44	33	5.4
2002	1	9	6	45.57	38.67	69.9	33	5.3
2002	1	11	11	17.08	0.4	119.66	33	5.2
2002	1	12	0	18.48	25.64	125.34	33	5.3

2002	1	15	7	12.8	-6.31	105.21	10	6.1
2002	1	16	13	33.67	23.9	125.42	10	5.5
2002	1	20	13	7.14	-45.92	34.89	10	5.5
2002	1	21	14	3.16	-5.63	102.34	33	5.1
2002	1	22	4	53.26	35.79	26.62	88	6.2
2002	1	22	20	15.63	3.49	95.63	33	5.2
2002	1	22	23	3.48	-2.88	101.21	33	5
2002	1	24	15	24.5	3.51	95.61	33	5.4
2002	1	24	17	52.54	3.54	95.66	33	5.4
2002	1	25	14	5.84	3.48	95.68	33	5
2002	1	27	22	33.36	33.12	75.91	40	5.3
2002	1	28	5	31.14	-4.46	102.09	33	5
2002	1	29	2	24.51	22.89	121.5	33	4.8
2002	1	29	17	49.5	36.49	70.33	214	4.8
2002	2	2	12	17.75	-5.42	102.08	33	4.8
2002	2	3	7	11.84	38.57	31.27	5	6.5
2002	2	3	9	26.33	38.63	30.9	10	6
2002	2	3	11	39.53	38.55	31.18	10	5.3
2002	2	8	9	1.47	-11.93	123.96	33	5
2002	2	8	10	46.03	-8.85	124.27	109	5.1
2002	2	10	1	47.62	-55.91	-29	193	5.9
2002	2	11	5	23.85	1.93	97	26	5
2002	2	12	3	27.59	23.72	121.56	54	5.7
2002	2	12	16	35.99	-59.78	-26.24	33	5.3
2002	2	24	13	14.83	-5.7	110.9	545	5.2
2002	2	26	1	50.17	3.41	86.38	10	4.8
2002	2	28	17	19.72	-4.12	101.38	32	5.1
2002	3	3	12	8.78	36.43	70.44	209	6.3
2002	3	5	1	47.8	-30.52	117.18	10	5
2002	3	5	15	40.9	0.8	119.94	33	5.2
2002	3	5	21	16.91	6.03	124.25	31	7.5
2002	3	6	4	8.9	5.96	124.43	33	4.9
2002	3	6	14	36.58	5.85	124.81	33	5.4
2002	3	6	19	19.52	5.73	124.54	33	5.1
2002	3	7	7	10.13	-1.32	-24.48	10	5.6
2002	3	8	18	27.31	5.87	124.27	23	6
2002	3	8	19	8.53	5.93	124.37	33	5.4
2002	3	9	12	27.12	-56.02	-27.33	118	6
2002	3	10	5	24.09	20.14	122.11	33	5.6
2002	3	11	20	6.71	25.24	56.15	10	5
2002	3	12	20	51.39	13.85	93.2	33	4.8
2002	3	13	6	26.98	20.38	-45.49	10	4.9

2002	3	24	14	35.61	24.36	-46.35	10	5.5
2002	3	25	14	56.38	36.06	69.32	8	6.1
2002	3	25	15	46.01	35.95	69.24	10	5.1
2002	3	26	3	45.48	23.35	124.09	33	6.4
2002	3	26	6	51.46	23.23	123.99	33	5
2002	3	26	7	24.34	23.27	124.05	33	4.8
2002	3	27	8	52.22	36.02	69.34	10	5.6
2002	3	27	22	46.27	-0.5	98.68	33	5.1
2002	3	28	5	48.59	22.64	-45.15	10	5.9
2002	3	30	8	57.61	-4.8	103.13	33	5.1
2002	3	30	22	31.24	-5.27	102.15	33	5.3
2002	3	31	6	52.04	24.28	122.18	32	7.1
2002	3	31	19	7.45	53.87	-35.37	10	5.1
2002	3	31	22	49.95	53.88	-35.37	10	5.4
2002	4	1	19	20.54	-58.65	-25.09	33	5.2
2007	8	11	14	35.48	27.34	87.74	35	5
2007	8	12	19	22.25	-37.52	-17.58	10	5.1
2007	8	13	22	23.44	-30.99	-13.41	10	5.5
2007	8	16	14	18.24	-3.52	-12.15	10	5.5
2007	8	18	4	38.34	2.08	96.69	30	5
2007	8	19	0	4.12	-60.39	-26.86	30	5.5
2007	8	19	1	32.99	-60.28	-26.47	7	5.4
2007	8	19	13	34.24	0.87	97.53	30	5
2007	8	20	12	37.66	-0.26	-18.17	10	5.7
2007	8	20	22	42.85	8.04	-39.25	6	6.5
2007	8	21	16	36.53	8.01	-38.97	10	5.3
2007	8	23	4	49.19	55.9	113.48	18	4.8
2007	8	25	4	24.19	28.15	56.65	10	5
2007	8	25	17	3.07	14.29	93.99	65	5.2
2007	8	25	22	5.49	39.28	41.12	10	5.3
2007	8	29	3	0.79	21.78	121.43	24	5.4
2007	8	30	7	34.43	-49.58	117.4	10	5.1
2007	8	30	11	7.89	1.8	99.32	145	5.4
2007	9	1	1	56.91	27.8	-44.11	10	5.3
2007	9	6	17	51.61	24.34	122.22	53	6.2
2007	9	7	9	25.79	7.32	-34.68	10	5.4
2007	9	7	23	56.33	-7.14	103.28	30	5.1
2007	9	8	8	39.81	0.29	97.75	25	5.2
2007	9	8	11	31.43	0.34	97.8	30	5.1
2007	9	11	16	36.99	-5.73	105.53	10	5
2007	9	12	11	10.68	-4.44	101.37	34	8.5
2007	9	12	12	21.47	-2.71	100.28	35	5.2

2007	9	12	13	2.74	-2.93	101.38	35	5.6
2007	9	12	14	4.61	-4.2	101.19	25	4.9
2007	9	12	14	40.57	-3.16	101.46	35	5.9
2007	9	12	15	35.99	-4.08	101.18	35	5
2007	9	12	16	7.13	-3.52	100.99	35	4.5
2007	9	12	16	37.39	-3.14	101.4	35	5.8
2007	9	12	23	19.69	-4.01	101	26	5.1
2007	9	13	1	26.44	-1.9	99.82	16	5.7
2007	9	13	3	35.87	-2.13	99.63	22	7
2007	9	13	4	6.36	-1.61	99.64	29	5.1
2007	9	13	5	23.32	-1.72	99.64	32	5.5
2007	9	13	6	32.25	-1.94	99.51	34	5.2
2007	9	13	10	47.28	-3.43	101.66	35	5.1
2007	9	13	11	34.85	-2.57	100.49	35	5
2007	9	13	12	13.39	-3.59	100.85	35	5.1
2007	9	13	13	10.44	-2.75	100.97	17	5.5
2007	9	13	15	8.46	-4.3	101.27	24	5.2
2007	9	13	16	9.68	-3.17	101.52	53	6
2007	9	13	23	12.32	-2.84	101.23	35	5
2007	9	14	1	2.53	-3.78	101.83	26	5.4
2007	9	14	3	7.14	-2.92	101.14	40	5.1
2007	9	14	4	3.43	-2.15	100.12	29	5.2
2007	9	14	6	1.22	-4.07	101.17	23	6.4
2007	9	14	13	7.82	-3	102.35	35	5.3
2007	9	15	1	41.65	-2.84	100.25	35	5
2007	9	15	7	30.2	2.74	66.14	10	5
2007	9	15	14	26.59	-4.23	101.22	35	5
2007	9	15	14	45.91	-2.79	101.19	35	5.5
2007	9	15	15	4.63	-2.8	101.24	35	5
2007	9	15	18	27.89	-1.76	99.72	35	5
2007	9	16	1	15.89	-2.76	101.11	38	5.2
2007	9	16	9	10.98	-2.72	101.17	35	5.2
2007	9	16	11	37.39	-2.83	101.2	35	5.3
2007	9	17	15	55.4	-3.64	100.77	25	5.1
2007	9	18	6	32.23	-4.04	101.03	25	5
2007	9	18	8	41.27	-3.26	101.35	35	5.6
2007	9	18	9	1.07	19.97	93.67	32	5.1
2007	9	18	10	3.21	0.13	97.71	25	5.1
2007	9	19	7	27.5	-2.75	100.89	35	6
2007	9	19	17	16.62	-32.24	-13.92	10	5.4
2007	9	20	3	31.97	19.25	121.26	37	5.3
2007	9	20	8	31.44	-2	100.14	30	6.7

2007	9	21	13	33.96	-2.18	99.53	25	5.1
2007	9	22	6	35.72	42.88	-31.87	10	5.2
2007	9	22	11	2.42	-2	99.94	35	5.3
2007	9	23	0	54.29	35.27	27.12	24	5.3
2007	9	23	14	13.43	-2.13	99.93	28	5.5
2007	9	23	22	23.72	-3.68	100.85	35	5.4
2007	9	24	5	42.07	-3.01	101.38	35	5
2007	9	24	8	15.51	-3.15	100.36	18	5.7
2007	9	24	9	51.7	-1.57	100.07	35	5.4
2007	9	24	12	26.09	-4.39	101.46	35	5.3
2007	9	24	17	35.91	-5.88	105.57	35	5
2007	9	24	21	25.81	-4.41	101.3	35	5
2007	9	25	8	27.44	-1.77	100.46	35	5.3
2007	9	26	15	43.14	-1.79	99.49	26	6.1
2007	9	26	18	39.48	-7.07	-11.71	10	5.6
2007	9	27	8	7.33	-3.49	100.84	35	5
2007	9	29	5	32.2	2.91	95.53	20	5.7
2007	10	1	5	15.48	9.9	57.55	10	4.8
2007	10	1	14	3.37	4.09	96.58	35	5
2007	10	2	3	43.89	-4.24	101.21	22	5.9
2007	10	2	14	39.88	-1.85	99.78	35	5.1
2007	10	4	12	40.11	2.54	92.9	35	6.2
2007	10	4	14	28.56	-8.28	116.81	10	5.7
2007	10	5	9	22.64	-4.38	101.34	35	5.1
2007	10	9	3	22.67	-6.59	71.53	10	5.4
2007	10	9	16	0.25	42.93	77.87	19	5
2007	10	10	0	19.67	-1.74	99.48	27	5.9
2007	10	10	12	25.66	9.7	91.8	36	5.2
2007	10	10	21	6.71	0.56	120.41	60	4.9
2007	10	11	20	38.53	-3.9	100.98	35	5.4
2007	10	11	22	42.1	17.61	-46.48	10	4.9
2007	10	12	0	31.29	-3.29	100.51	15	5.7
2007	10	14	11	2.92	0.76	98.75	75	5
2007	10	17	2	55.99	2.97	96.46	40	5
2007	10	17	14	40.04	23.5	121.71	51	5
2007	10	18	10	1.13	-3.41	101.68	39	4.9
2007	10	18	16	13.4	30.13	-42.59	10	5.7
2007	10	19	7	19.47	28.65	66.29	35	5.5
2007	10	21	12	34.13	-3.24	100.51	35	5.2
2007	10	21	14	24	-3.59	100.8	35	5.5
2007	10	21	16	25.5	-3.59	100.86	27	5.6
2007	10	23	6	25.94	1.84	97.05	35	5

2007	10	23	19	56.73	-2	99.9	30	5.8
2007	10	24	21	2.06	-3.9	101.02	21	6.8
2007	10	25	5	25.35	-3.54	100.79	29	5.5
2007	10	25	15	32.78	15.24	122.53	25	5
2007	10	26	4	53.83	-4.17	100.62	35	5.1
2007	10	31	15	54.26	-2.99	101.28	48	5.3
2007	11	3	9	19.54	36.46	70.86	174	5
2007	11	4	20	35.73	-67.03	111.2	10	5.7
2007	11	5	21	58.41	-3.74	101.09	25	5
2007	11	6	9	38.57	21.18	70.72	10	5.1
2007	11	7	7	10.19	22.15	92.39	28	5.5
2007	11	7	11	4.7	-3.64	100.72	31	5.1
2007	11	8	7	44.1	-55.98	-27.93	90	5.4
2007	11	9	1	43.04	38.73	25.72	9	5.2
2007	11	9	6	54.7	-6.51	104.56	35	5.1
2007	11	9	20	25.7	18.6	121.09	14	5.2
2007	11	9	21	26.84	-56.27	-27.3	155	4.9
2007	11	10	2	43.46	-8.56	107.85	34	5.3
2007	11	10	9	43.13	-4.44	101.31	35	5.1
2007	11	10	23	19.33	-3.28	100.53	15	5.9
2007	11	20	22	59.86	-4.33	101.26	35	5.4
2007	11	21	3	30.32	3.06	96.36	41	4.9
2007	11	22	23	2.29	4.74	95.06	49	5.8
2007	11	23	19	18.47	-53.27	9.43	10	5.5
2007	11	25	2	51.72	-2.81	101.16	55	5.9
2007	11	25	16	2.57	-8.29	118.37	20	6.5
2007	11	25	17	41.8	-2.24	100.41	35	6
2007	11	25	19	53.54	-8.22	118.47	18	6.5
2007	11	26	2	31.76	-8.25	118.61	32	5.4
2007	11	26	8	14.43	-8.21	118.69	35	5.3
2007	11	27	4	26.85	16.06	119.84	35	5.9
2007	11	27	10	13.96	-1.36	-13.29	10	5.4
2007	11	29	0	5.71	-2.86	101.14	35	5.4
2007	11	29	19	0.04	14.94	-61.27	156	7.4
2007	12	1	1	44.19	1.98	97.88	44	5.9
2007	12	1	17	47.82	-4.62	101.36	10	5.3
2007	12	1	21	21.91	-4.45	101.36	27	5.1
2007	12	1	23	1.32	-7.07	105.99	87	5
2007	12	4	15	48.45	-8.68	122.38	132	5.1
2007	12	6	17	12.32	22.69	-45.11	10	5.8
2007	12	7	10	45.37	-9.98	113.47	10	5.3
2007	12	8	3	54.6	-60.51	-52.38	10	5.8

2007	12	11	17	20.48	-62.06	-65.83	10	5.9
2007	12	13	14	9.53	-39.36	78.15	10	5.2
2007	12	22	12	26.74	2.09	96.81	23	6.1
2008	1	1	6	32.79	40.29	72.99	6	5.6
2008	1	3	11	15.85	-5.92	122.66	10	5.4
2008	1	4	7	29.18	-2.78	101.03	35	6
2008	1	5	20	1.5	5.48	94.68	57	5.3
2008	1	6	5	14.01	37.22	22.69	75	6.2
2008	1	6	8	54.59	-9.29	107.49	29	5.1
2008	1	9	8	26.54	32.29	85.17	10	6.4
2008	1	12	8	32.67	-56.4	-27.21	89	5.3
2008	1	13	12	15.35	17.05	120.99	10	5.7
2008	1	14	1	20.26	-35.4	53.88	10	5.4
2008	1	14	13	38.59	10.41	92.87	34	5.9
2008	1	16	11	54.41	32.33	85.16	9	5.9
2008	1	20	5	13.13	-59.33	-23.51	10	5.1
2008	1	22	17	14.2	0.92	97.46	10	5.4
2008	1	22	18	43.27	32.35	85.26	5	5.5
2008	1	24	12	3.04	-4.03	101.87	35	5.3
2008	1	29	14	57.26	-58.74	-25.24	35	5.6
2008	2	3	10	55.34	-8.62	111.52	35	5.1
2008	2	3	14	24.73	-56.27	-27.04	99	5.6
2008	2	4	3	32.88	18.15	122.54	20	5.1
2008	2	5	5	56.69	-3.52	118.07	13	5.9
2008	2	7	7	50.52	1.23	122.65	35	5.8
2008	2	7	20	58.89	-7.58	116.82	321	5.7
2008	2	8	9	38.14	10.67	-41.9	9	6.9
2008	2	9	18	34.01	-0.24	125.08	38	6
2008	2	10	12	22.26	-60.8	-25.59	8	6.6
2008	2	12	1	29.09	-3.01	101.21	47	5.5
2008	2	14	10	9.27	36.5	21.67	29	6.9
2008	2	14	12	8.57	36.35	21.86	28	6.5
2008	2	19	16	57.78	20.28	121.1	10	5.2
2008	2	19	17	1.96	-2.43	99.95	14	5.4
2008	2	20	8	8.05	2.77	95.96	26	7.4
2008	2	20	12	11.07	-52.92	-46.49	10	5.5
2008	2	20	18	27	36.29	21.77	9	6.2
2008	2	21	2	46.81	77.08	18.57	12	6.1
2008	2	21	23	55.64	-2.32	99.88	24	5.7
2008	2	23	7	17.14	-2.51	99.96	32	5.6
2008	2	23	15	57.04	-57.33	-23.43	14	6.8
2008	2	24	14	40.99	-2.47	99.96	22	5.3

2008	2	25	8	36.3	-2.49	99.97	25	7.2
2008	2	25	18	6.03	-2.33	99.89	25	6.6
2008	2	25	21	2.84	-2.24	99.81	25	6.7
2008	2	26	18	18.75	-3.85	101.07	20	5.9
2008	2	29	16	10.28	-53.01	-46.44	10	5.4
2008	3	3	2	37.71	-2.18	99.82	25	6.2
2008	3	3	13	49.04	19.91	121.33	10	6
2008	3	3	17	48.21	-4.47	101.45	27	5.6
2008	3	3	18	1.07	14.23	56.57	10	5.4
2008	3	13	13	28.48	-45.49	35.01	10	6
2008	3	15	14	43.26	2.71	94.6	25	6
2008	3	20	22	32.79	35.49	81.47	10	7.2
2008	3	28	22	41.22	20.25	121.95	10	5.8
2008	3	29	8	9.77	20.27	121.98	16	5.5
2008	3	29	17	30.01	2.86	95.3	20	6.3
2008	4	1	11	5.37	-38.94	46.31	10	5.4
2008	4	2	8	48.97	-4.35	102.72	67	5.7
2008	4	2	14	36.07	-4.88	69.24	10	5.7
2008	4	14	9	45.19	-56.02	-28.03	140	6
2008	4	23	18	28.18	22.88	121.62	10	6
2008	4	24	12	14.99	-1.18	-23.47	10	6.5
2008	4	28	15	31.73	-58.69	-24.78	35	5.2
2008	4	28	15	57.52	-58.74	-24.71	35	6.1
2008	5	3	3	53.49	-3.02	101.32	50	5.3
2008	5	12	6	28.15	31	103.32	19	7.9
2008	5	12	9	7.04	31.21	103.68	10	5
2008	5	12	11	11.24	31.21	103.62	10	6.1
2008	5	12	20	8.04	31.41	103.89	21	5.6
2008	5	13	7	7.08	30.89	103.19	9	5.8
2008	5	13	10	29.93	4.68	95.09	35	5.4
2008	5	15	14	23.88	-57.91	-25.48	35	5.9
2008	5	16	5	25.73	31.35	103.35	3	5.6
2008	5	17	17	8.54	32.24	104.98	9	5.8
2008	5	18	12	17.33	-3.2	101.41	32	5.7
2008	5	19	14	26.5	1.64	99.15	10	6
2008	5	20	17	8	-3.18	101.47	47	5.7
2008	5	21	22	22.56	-4.13	101.27	19	5.5
2008	5	23	19	35.47	7.31	-34.9	8	6.5
2008	5	25	8	21.99	32.56	105.42	18	6.1
2008	5	27	8	3.27	32.7	105.53	10	5.2
2008	5	27	8	37.15	32.71	105.54	10	5.7
2008	5	29	15	46.03	64	-21.01	9	6.3

2008	5	31	4	37.6	-41.2	80.48	9	6.4
2008	6	1	1	57.36	20.12	121.35	31	6.3
2008	6	3	17	31.23	-8.17	120.25	14	5.9
2008	6	3	21	3.46	-8.12	120.26	7	5.8
2008	6	3	22	4.78	-8.1	120.23	14	6
2008	6	6	20	2.68	35.88	-0.66	4	5.5
2008	6	8	12	25.97	37.96	21.52	16	6.4
2008	6	10	10	4.8	33.18	91.96	10	5.4
2008	6	25	2	53.54	1.34	97.19	16	5.7
2008	6	27	11	40.39	11.01	91.82	17	6.6
2008	6	27	13	7.08	10.89	91.78	17	5.9
2008	6	28	12	54.63	10.85	91.71	15	6.1
2008	6	28	15	29.11	10.9	91.93	20	5.4
2008	6	30	6	17.3	-58.23	-22.1	8	7
2008	7	1	1	54.13	-58.12	-21.88	10	5.6
2008	8	10	8	20.34	11.06	91.81	20	6.2
2008	8	10	9	27.74	11.02	91.76	29	5.3
2008	8	11	23	38.83	-1.02	-21.84	13	6
2008	8	13	8	35.2	83.64	115.25	10	5.4
2008	8	15	10	25.65	12.9	124.32	10	6
2008	8	16	4	1.08	52.27	98.21	12	5.7
2008	8	16	7	25.69	5.72	61.21	10	5.4
2008	8	16	8	17.3	5.67	61.33	10	4.6
2008	8	16	8	26.39	5.52	61.3	10	5.1
2008	8	17	15	39.83	-52.87	-4.45	10	5.6
2008	8	19	8	33.52	-8.2	-13.45	10	5.5
2008	8	21	12	20.87	24.86	97.82	37	4.9
2008	8	21	12	24.09	25.04	97.7	10	6
2008	8	22	7	47.95	-17.77	65.39	6	6
2008	8	25	13	21.88	30.9	83.52	12	6.7
2008	8	25	14	36.54	30.51	83.27	10	4.6
2008	8	26	3	7.29	-6.34	104.47	21	5.7
2008	8	27	1	35.21	51.61	104.16	16	6.3
2008	8	27	21	52.81	32.31	47.35	10	5.8
2008	8	28	2	59.91	-8.63	119.09	165	5
2008	8	28	15	22.23	-0.25	-17.36	12	6.3
2008	8	30	8	30.3	26.24	101.89	11	6
2008	8	31	8	31.1	26.23	101.97	10	5.6
2008	9	2	0	6.93	-4.48	101.46	24	5
2008	9	2	9	0.03	0.49	98.09	35	5.1
2008	9	4	12	53.12	30.28	80.35	10	5
2008	9	5	4	57.25	36.54	71.29	230	5.4

2008	9	5	19	7.82	-1.17	-13.95	10	5.8
2008	9	6	5	47.99	36.49	70.93	191	5.8
2008	9	9	7	43.33	24.67	122.57	101	5.5
2008	9	10	1	14.18	30.78	83.59	10	5.3
2008	9	10	3	0.08	2.51	96.32	43	5.5
2008	9	10	11	0.4	26.74	55.83	12	6.1
2008	9	10	13	8.46	8.09	-38.71	9	6.6
2008	9	16	7	28.5	0.9	-29	10	5.8
2008	9	17	17	43.04	27	56.2	4	5.2
2008	9	24	17	12.57	-22.71	-12.76	10	5.3
2008	9	25	1	47.11	30.84	83.49	4	6
2008	9	26	18	46.85	3.07	65.32	10	5.7
2008	9	27	3	4.17	13.47	120.57	10	5.7
2008	10	1	18	4.38	13.37	120.44	10	5.5
2008	10	3	5	26.09	7.52	-36.76	5	5.7
2008	10	4	7	56.25	-59.34	-25.9	35	5.7
2008	10	5	15	52.49	39.53	73.82	27	6.7
2008	10	5	16	11.04	39.51	73.89	35	5.6
2008	10	5	22	56.89	33.89	69.47	10	6
2008	10	6	8	30.55	29.81	90.35	12	6.3
2008	10	6	12	10.33	29.65	90.32	10	5.2
2008	10	8	14	7.62	29.76	90.33	9	5.5
2008	10	8	19	9.84	12.98	124.36	44	5.4
2008	10	9	20	20.45	-36.63	79.34	10	5.2
2008	10	11	9	6.07	43.37	46.25	16	5.8
2008	10	13	16	5.5	39.5	73.81	35	5.2
2008	10	13	17	16.99	38.56	70.34	10	5.2
2008	10	20	4	54.92	0.11	120.68	96	5.9
2008	10	25	20	17.2	26.53	54.99	28	5.4
2008	10	26	1	28.6	36.49	70.68	210	5.7
2008	10	28	23	9.76	30.64	67.35	15	6.4
2008	10	29	11	32.31	30.6	67.46	14	6.4
2008	10	31	23	59.29	30.54	67.44	10	5.1
2008	11	3	19	21.84	1.14	97.25	10	5.7
2008	11	10	1	22.25	37.56	95.83	19	6.3
2008	11	11	12	18.27	1.59	66.7	10	5.2
2008	11	11	21	56.18	37.54	95.84	10	5.1
2008	11	11	22	46.83	0.02	67.09	10	5.1
2008	11	13	15	10.59	-55.96	-27.23	87	5.6
2008	11	14	2	5.09	-53.79	8.73	12	5.9
2008	11	16	12	20.68	10.83	91.71	26	5.5
2008	11	16	17	2.32	1.27	122.09	30	7.4

2008	11	16	18	20.24	1.13	121.78	35	5.5
2008	11	19	17	14.02	8.66	93.64	44	5.2
2008	11	22	16	1.01	-4.35	101.26	24	6.3
2008	11	22	18	49.23	-1.23	-13.93	10	6.3
2008	11	22	22	5.94	-4.61	101.22	35	5.1
2008	11	25	1	19.75	-46.78	-10.72	10	5.4
2008	11	28	8	50.79	-4.76	101.76	25	5.9
2008	11	28	9	38.46	22.48	-45.02	10	5.2
2008	12	5	23	24.69	8.74	94.08	28	5.2
2008	12	5	23	33.56	8.71	93.97	41	4.6
2008	12	6	0	43.87	8.72	93.98	38	5.3
2008	12	6	9	24.85	43.96	86.02	69	5
2008	12	7	6	23.99	13.35	-44.83	10	5.6
2008	12	7	13	36.21	26.99	55.8	15	5.4
2008	12	7	21	18.36	23.84	122.17	12	5.2
2008	12	8	1	51.1	13.41	-44.79	10	5.5
2008	12	8	14	41.43	26.92	55.85	6	5.1
2008	12	8	18	39.94	-53.01	106.82	11	6.3
2008	12	9	2	46.27	30.34	67.56	10	5.2
2008	12	9	5	53.3	30.39	67.45	10	5.3
2008	12	9	12	57.8	30.31	67.64	10	5.2
2008	12	9	15	9.23	26.8	55.68	14	5
2008	12	9	18	53.11	32.52	105.39	24	5.1
2008	12	9	21	0.24	7.66	92.22	43	5.1
2008	12	9	22	52.76	30.44	67.4	10	5.7
2008	12	11	12	31.54	35.31	81.41	10	5
2008	12	11	20	55.41	-5.84	105.33	35	5.2
2008	12	13	8	27.19	38.72	22.57	24	5.2
2008	12	13	8	45.63	-48.98	123.4	10	5.9
2008	12	13	17	21.14	8.01	-38.02	10	5
2008	12	14	20	36.98	-60.08	-18.76	10	5.5
2008	12	15	16	50.49	-16.17	67.51	10	5
2008	12	15	21	18.1	-2.83	101.04	48	5.3
2008	12	16	10	19	-16.29	67.12	10	5.2
2008	12	17	13	47.96	6.88	94.76	137	5
2008	12	17	16	6.81	-6.07	103.51	35	5.2
2008	12	17	21	57.48	39.21	15.44	257	5.3
2008	12	19	8	31.51	47.01	-27.29	5	5.9
2008	12	20	21	5.16	-31.19	-13.34	4	5.8
2008	12	20	22	13.8	-31.12	-13.42	10	5.4
2008	12	21	13	47.23	4.83	95.04	56	5.4
2008	12	25	22	40.23	23.42	64.5	13	5.8

2008	12	29	3	37.1	36.39	71.07	151	5.8
2008	12	29	12	11.54	-1.19	67.56	10	5.2
2008	12	30	19	49.26	-4.3	101.22	20	5.9
2008	12	30	20	32.8	-4.37	101.19	10	5.1
2009	1	1	10	35.42	1.32	121.84	33	5.1
2009	1	1	16	57.31	-4.33	101.3	19	5.5
2009	1	1	18	37.41	-4.33	101.24	26	5.3
2009	1	2	19	42.71	0.62	-26.66	10	5.6
2009	1	2	20	14.06	0.79	-27.12	10	5.5
2009	1	3	20	0.39	-0.33	133.05	35	4.8
2009	1	4	20	22.47	6.45	94.17	35	5.3
2009	1	4	23	12.92	36.44	70.88	186	5.7
2009	1	5	16	54.33	-3.53	100.72	27	5.2
2009	1	8	12	4.57	41.8	20.83	17	4.9
2009	1	9	3	44.38	10.44	56.96	10	5.7
2009	1	12	22	14.02	2.82	95.78	58	5.1
2009	1	13	1	4.26	-13.15	66.08	10	6
2009	1	13	6	12.42	35.66	26.39	42	5.3
2009	1	16	22	13.96	14.49	-45.06	10	5.4
2009	1	21	6	27.74	-20.17	66.41	10	5.2
2009	1	23	12	38.13	21.12	121.24	10	5.3
2009	1	24	22	43.88	5.49	126.28	144	5.1
2009	1	26	5	23.46	0.07	100.04	127	5
2009	1	26	19	33.47	-0.35	98.18	10	5.7
2009	1	28	0	1.45	-0.26	98.28	20	5.7
2009	1	28	7	53.81	-8.94	124.16	65	5.7
2009	1	28	20	29.68	13.73	92.82	35	5.1
2009	1	29	22	43.51	10.97	124.96	8	5.4
2009	1	31	4	27.58	11.8	94.96	26	5.1
2009	2	11	17	34.04	3.89	126.39	20	7.2
2009	2	11	19	1.54	3.83	126.48	35	5.5
2009	2	12	3	1.54	3.81	126.57	35	5.1
2009	2	12	3	49.96	3.95	126.41	26	6
2009	2	12	15	44.19	3.93	126.47	35	5
2009	2	12	17	46.53	3.98	126.48	43	5.7
2009	2	12	20	25.51	-8.24	121.37	221	5.4
2009	2	13	21	26.66	3.78	126.46	32	5.4
2009	2	16	23	16.38	37.13	20.78	15	5.5
2009	2	18	0	9.88	-52.96	20.89	10	5.1
2009	2	18	3	7.03	-52.97	20.91	10	5.9
2009	2	20	3	48.85	34.2	73.9	12	5.5
2009	2	21	16	53.43	55.45	-35.07	10	5.4

2009	2	23	5	56.16	0.48	98.55	35	5.4
2009	2	24	0	46.04	-0.25	-18.32	10	5.2
2009	2	24	1	26.66	-27.05	75.14	10	5.1
2009	2	24	10	35.96	-1.74	120.54	35	5.1
2009	2	24	12	13.35	1.42	97.17	23	5.6
2009	2	25	16	8.01	-41.89	88.63	10	5.5
2009	2	26	12	32.24	19.02	121.26	38	5.5
2009	2	28	14	33.63	-60.53	-24.8	15	6.3
2009	3	2	0	3.97	-1.11	119.87	11	5.6
2009	3	3	6	5.35	-56.35	-27.06	134	5.3
2009	3	5	19	41.4	80.28	-1.83	10	5.5
2009	3	6	10	50.94	80.32	-1.85	9	6.5
2009	3	12	11	47.58	-52.93	27.2	10	5.2
2009	3	20	16	1.44	-58.69	-24.84	26	5.4
2009	3	23	4	28.17	9.8	57.82	10	5.5
2009	3	26	6	14.21	-27.46	73.3	10	5.7
2009	4	1	14	27.66	-3.51	100.63	26	5.3
2009	4	3	9	11.82	-59.55	-26.25	35	5.2
2009	4	4	18	39.71	-55.98	-27.73	87	5.5
2009	4	6	1	32.03	42.33	13.33	8	6.3
2009	4	7	17	47.03	42.28	13.46	15	5.5
2009	4	8	6	26.46	-58.1	-6.26	10	5.6
2009	4	15	17	47.77	-3.08	100.42	19	5.7
2009	4	15	20	1.46	-3.12	100.47	22	6.3
2009	4	16	5	17.94	-12.45	65.21	10	5.2
2009	4	16	14	57.06	-60.2	-26.86	20	6.7
2009	4	16	15	3.07	-60.38	-26.92	19	5
2009	4	16	19	55.49	-3.33	100.32	7	5.5
2009	4	16	20	51.63	-3.22	100.46	41	5
2009	4	17	15	35.67	-49.52	125.93	10	5.3
2009	4	25	17	18.86	45.65	26.61	100	5.2
2009	4	27	20	4.46	42.84	72.43	18	5
2009	4	28	19	54.5	52.67	-35.03	10	5.6
2009	5	5	2	40.03	-43.52	-16.12	10	5
2009	5	10	8	58.43	-5.44	101.14	31	5.2
2009	5	11	14	32.03	-30.05	-13.9	10	5.2
2009	5	12	12	38.08	-12.43	65.14	10	5.8
2009	5	13	23	2.56	-55.87	-26.92	44	5.4
2009	5	19	3	26.33	-47.35	-13.37	10	4.9
2009	5	19	17	35.1	25.29	37.74	5	5.7
2009	5	20	9	57.24	-7.14	67.97	10	5.3
2009	5	24	1	6.28	14.85	119.8	58	5.4

2009	5	24	6	49.33	-42.08	88.35	10	5.6
2009	5	27	2	50.36	-33.07	-15.95	10	5
2009	5	28	21	7.77	-55.88	-28.18	96	5
2009	5	29	19	12.24	0.96	126.11	35	5.3
2009	6	3	4	36.26	-37.94	49.28	10	5.1
2009	6	3	18	54.83	-50.01	120.59	3	5.7
2009	6	4	17	25.25	-45.83	35.14	16	6
2009	6	6	15	37.75	-47.88	99.67	10	5.2
2009	6	6	20	33.88	23.86	-46.1	14	6
2009	6	7	5	25.56	-8.44	118.39	146	5
2009	6	11	0	15.63	-4.89	102.9	22	5.3
2009	6	13	17	17.82	44.72	78.86	14	5.4
2009	6	14	3	36	-7.69	117.2	17	5.5
2009	6	14	5	58.32	5.36	126.44	35	6.1
2009	6	16	20	5.69	-54.37	5.87	10	6.1
2009	6	19	14	4.9	35.36	28.45	28	5.8
2009	6	20	9	21.38	-4.99	103.05	46	5.4
2009	6	21	12	27.61	76.28	7.16	10	5.1
2009	6	22	18	15.99	76.22	6.79	10	5.4
2009	6	24	11	12.19	0.17	-16.88	10	5.2
2009	6	25	12	34.78	-23.81	-13.43	10	5.3
2009	6	27	15	45.91	-33.2	-15.94	13	5.6
2009	6	28	14	18.44	1.34	122.29	35	5
2009	6	28	14	19.03	1.38	122.2	36	5.7
2009	7	1	9	30.04	34.16	25.47	19	6.4
2009	7	1	21	10.44	1.05	125.96	37	5.8
2009	7	2	3	20.91	-11.63	-14.16	10	5.4
2009	7	3	20	28.5	-49.75	-8.05	10	5.3
2009	7	7	16	31.1	-26.74	67.48	10	5.7
2009	7	9	11	19.62	25.63	101.1	7	5.7
2009	7	13	10	52.99	-9.14	119.32	65	5.9
2009	7	13	10	52.02	-9.13	119.32	67	5.9
2009	7	13	18	5.14	24.06	122.2	17	6.3
2009	7	18	20	32.99	35.89	43.35	25	5.1
2009	7	21	19	55.5	-13.67	66.11	10	5.2
2009	7	22	3	53	26.77	55.79	9	5.3
2009	7	24	3	11.68	31.16	85.9	13	5.8
2009	7	26	23	10.35	-4.81	102.89	40	5.7
2009	7	28	8	43.54	-5.5	101.71	16	5.6
2009	7	29	9	31.71	-5.52	101.58	3	5.2
2009	7	29	16	53.38	21.98	120.45	11	5.4
2009	7	31	0	5.71	-9.96	118.75	18	5.4

2009	7	31	14	56.64	-8.8	108.74	17	5.4
2009	8	1	22	0.04	-9.19	123.18	113	5.3
2009	8	5	6	28.18	-8.76	67.5	10	5.2
2009	8	10	19	55.87	14.1	92.9	24	7.5
2009	8	12	14	50.42	-57.66	-25.25	28	5.5
2009	8	12	20	4.5	6.04	126.38	95	5.7
2009	8	13	9	21.57	14.05	92.82	35	5.9
2009	8	16	7	38.21	-1.48	99.49	20	6.7
2009	8	16	12	49	-1.45	99.43	21	5.8
2009	8	17	0	5.9	23.5	123.5	20	6.7
2009	8	17	10	10.56	23.43	123.52	15	6.1
2009	8	18	17	50.4	-0.91	97.95	10	5.9
2009	8	20	6	35.44	72.2	0.94	6	6
2009	8	23	17	38.38	-1.65	99.57	18	5.4
2009	8	26	22	20.29	9.38	124.02	571	5.3
2009	8	28	1	51.2	-7.15	123.43	642	6.9
2009	8	28	2	14.61	37.65	95.71	4	5.6
2009	8	29	13	59.6	12.92	57.6	10	5.3
2009	8	30	19	27.88	25.28	95.1	82	5.2
2009	8	31	10	15.97	37.61	95.83	6	5.8
2009	8	31	10	15.04	37.62	95.84	10	5.7
2009	9	2	7	55.1	-7.78	107.3	46	7
2009	9	2	8	2.21	-7.82	107.39	51	5.5
2009	9	3	19	51.69	24.33	94.67	95	5.9
2009	9	4	22	16.47	-48.3	31.67	10	5.4
2009	9	6	21	49.21	41.48	20.39	3	5.5
2009	9	7	16	12.25	-10.2	110.63	23	6.2
2009	9	7	22	41.73	42.66	43.44	15	6
2009	9	9	8	6.33	2.41	126.01	106	5.7
2009	9	18	6	23.34	12.62	120.43	12	6
2009	9	18	11	53.8	6.51	124.71	10	5.7
2009	9	18	23	6.77	-9.14	115.59	79	5.7
2009	9	19	4	17.68	36.48	70.74	199	5
2009	9	21	8	30.39	71.04	-7.67	10	5.6
2009	9	21	8	53.59	27.33	91.44	14	6.1
2009	9	21	19	38.23	20.4	94.79	84	5.7
2009	9	26	4	22.75	-29.56	60.85	10	5.2
2009	9	28	12	13.74	-25.63	-13.75	10	5.4
2009	9	30	10	16.92	-0.72	99.87	81	7.6
2009	10	1	1	52.73	-2.52	101.5	9	6.6
2009	10	1	2	20.09	-2.41	101.42	10	5.3
2009	10	3	17	36.61	23.63	121.45	28	6.1

2009	10	4	10	58.01	6.74	123.38	620	6.6
2009	10	4	11	4.79	6.68	123.53	640	5.6
2009	10	6	11	13.41	-2.26	68.7	10	5.3
2009	10	7	21	41.32	4.08	122.37	574	6.8
2009	10	7	23	22.12	46.63	-27.08	10	5.4
2009	10	12	3	15.72	-17.1	66.69	10	6.2
2009	10	15	18	33.66	-3.62	123.16	17	5.7
2009	10	16	9	52.08	-6.53	105.22	38	6.1
2009	10	22	19	51.75	36.52	70.95	185	6.2
2009	10	23	11	37.41	-12.39	65.21	10	5.4
2009	10	24	20	54.08	-9.9	118.79	35	5.6
2009	10	25	17	47.93	29.57	63.88	125	5.6
2009	10	29	17	0.38	27.26	91.42	26	5.1
2009	11	2	21	35.43	14.03	92.97	15	5.5
2009	11	3	5	25.81	37.5	20.49	10	5.8
2009	11	4	18	41.43	36.15	-33.88	2	5.9
2009	11	4	21	56.86	37.65	95.76	3	5.6
2009	11	5	9	32.65	23.73	120.74	18	5.6
2009	11	8	19	41.33	-8.21	118.63	18	6.6
2009	11	8	20	35.14	6.7	60.26	10	5.6
2009	11	9	0	21.89	-43.46	39.61	10	5.6
2009	11	10	2	48.67	8.08	91.9	23	6
2009	11	11	9	51.65	37.51	20.36	10	5.3
2009	11	11	13	48.92	9.36	125.53	23	5.7
2009	11	12	19	39.63	-4.73	103.12	69	5.4
2009	11	14	0	51.32	-38.49	-15.65	10	5.1
2009	11	18	1	42.77	-53.97	6.48	10	5.5
2009	11	18	2	17.05	-9.29	107.51	40	5.4
2009	11	20	19	31.61	-0.18	-18	5	5.5
2009	11	26	15	9.67	36.09	21.4	28	5
2009	11	28	6	4.33	-10.41	118.9	22	6
2009	11	28	18	10.06	5.33	126.29	38	6.1
2009	11	29	12	29.78	0.41	126.08	68	5.5
2009	11	29	20	9.91	5.34	126.25	35	5.7
2009	12	1	11	40.56	13.62	92.79	33	5.4
2009	12	2	20	27.21	12.19	125.55	14	5.5
2009	12	3	23	6.67	-2.71	68.04	10	5.4
2009	12	4	0	41.07	-29.44	77.66	10	5
2009	12	4	6	2.01	37.92	28.73	5	5.1
2009	12	9	16	0.33	-0.64	-21.07	10	6.4
2009	12	9	21	29.25	2.77	95.91	19	6
2009	12	12	11	51.57	17.11	73.77	10	5.1

2009	12	14	3	5.43	-10.03	123.66	45	5.5
2009	12	16	3	40.23	-55.49	-26.9	10	5.5
2009	12	17	1	37.8	36.46	-9.9	19	5.6
2009	12	17	14	55.62	42.45	-30.57	4	5.4
2009	12	18	7	32.96	-17.73	65.87	10	5.8
2009	12	19	13	2.7	23.8	121.61	57	6.4
2009	12	21	5	15.88	37.53	96.64	10	5
2009	12	22	6	6.34	35.72	31.51	63	5.3
2009	12	23	1	11.58	-1.43	99.39	19	6
2009	12	24	22	4.16	-55.44	-26.74	10	5.3
2009	12	29	9	1.53	24.36	94.81	124	5.7
2009	12	30	11	17.49	6.52	126.34	34	5.6
2009	12	31	9	57.97	27.32	91.51	10	5.5
2010	1	2	2	15.2	38.24	71.47	47	5.4
2010	1	5	4	55.89	-58.17	-14.7	10	6.8
2010	1	5	14	36.69	-2.44	121.31	38	5
2010	1	6	16	38.59	-41.6	-16.57	10	5.6
2010	1	18	15	56	38.4	21.96	0	5.5
2010	1	22	0	46.56	38.42	22.04	5	5.2
2010	1	26	15	22.62	-39.26	-15.9	10	5.7
2010	1	27	11	20.65	-38.65	-15.93	10	5
2010	1	27	12	31.59	-38.9	-15.83	10	5.4
2010	1	27	17	42.51	-14.1	-14.55	10	5.8
2010	1	27	19	0.3	-7.16	125.03	530	5.1
2010	2	5	6	59.05	-47.91	99.59	1	6.2
2010	2	10	20	46.48	1.04	126.24	42	5.5
2010	2	11	11	51.39	-40.59	-16.77	10	5.5
2010	2	11	18	43.97	-9.9	113.85	51	5.8
2010	2	11	21	56.15	34	25.39	14	5.4
2010	2	12	2	42.85	23.84	121.19	21	5.2
2010	2	15	21	51.77	-7.22	128.72	126	6.2
2010	2	26	0	11	-55.76	-4.76	6	5.6
2010	2	26	1	7.82	23.78	122.82	37	5.5
2010	2	26	8	37.02	6.48	126.8	92	5.7
2010	2	27	23	21.25	35.94	70.07	99	5.7
2010	3	1	3	15.33	7.05	126.31	27	5.1
2010	3	2	2	51.13	18.18	122.4	17	5.8
2010	3	2	22	18.2	3.44	126.84	64	5.1
2010	3	3	11	13.95	3.05	126.93	73	5
2010	3	4	0	18.15	22.93	120.8	22	6.3
2010	3	5	10	14.62	1.89	127.5	107	5
2010	3	5	16	7.06	-3.76	100.99	26	6.8

2010	3	5	22	3.84	1.32	126.36	61	5
2010	3	8	7	47.19	38.71	40.05	10	5.6
2010	3	9	6	0.54	11.23	125.46	78	5.1
2010	3	11	6	22.84	-57.28	-27.93	307	5.6
2010	3	11	21	9.9	-7.44	128.15	178	5.1
2010	3	12	23	19.51	23.06	94.62	102	5.5
2010	3	14	0	57.44	-1.69	128.13	53	6.4
2010	3	14	21	17.79	-7.09	67.98	10	5.4
2010	3	14	22	33.06	-58.42	-23.57	40	5.6
2010	3	21	6	55.76	-29.41	60.91	10	5.2
2010	3	22	4	36.71	-17.56	-13.08	10	5.2
2010	3	24	2	6.1	32.51	92.7	5	5.7
2010	3	25	5	29.47	13.83	120.07	16	6
2010	3	25	15	13.2	-7.29	128.46	165	5.4
2010	3	26	10	39.26	-6.33	130.28	124	5.7
2010	3	30	16	54.67	13.67	92.83	34	6.7
2010	4	6	22	15.21	2.36	97.13	31	7.8
2010	4	10	2	53.24	-7.15	129.58	97	5.3
2010	4	11	22	8.27	36.97	-3.54	609	6.3
2010	4	13	20	27.06	-56.33	-27.31	100	5.5
2010	4	14	0	1.75	32.92	96.86	22	5.4
2010	4	14	1	25.55	33.19	96.45	7	6.1
2010	4	17	7	22.92	3.74	126.58	35	5.3
2010	4	17	10	2.32	3.68	126.55	35	5.3
2010	4	18	20	28.02	35.63	67.66	13	5.6
2010	4	24	7	41.04	-1.91	128.12	27	6
2010	4	24	15	1.12	34.45	26.01	34	5.3
2010	4	25	21	9.44	-55.61	-27.73	7	5.7
2010	4	26	2	59.05	22.18	123.63	14	6.5
2010	4	27	17	17.28	-50.58	115.5	10	5.6
2010	5	7	7	39.98	3.56	127.98	140	5.6
2010	5	8	3	22.96	-8.09	118.26	12	5.9
2010	5	9	5	59.16	3.75	96.02	38	7.2
2010	5	11	12	17.7	3.5	95.85	40	5.3
2010	5	16	0	33.63	0.51	124.66	123	5.8
2010	5	16	19	6.7	-34.66	-15.4	10	5.2
2010	5	25	10	9.57	35.34	-35.92	10	6.3
2010	5	28	18	32.17	-3.86	100.97	24	5.3
2010	5	29	2	29.86	33.17	96.07	7	5.8
2010	5	31	10	16.23	6.95	124	35	5.9
2010	5	31	19	51.58	11.13	93.47	112	6.5
2010	6	2	1	49.39	-57.37	-26.45	127	5.9

2010	6	3	4	32.25	70.71	-14.38	10	5.6
2010	6	3	9	24.55	4.78	95.79	74	5.4
2010	6	4	15	12.29	-9.56	108.28	35	5
2010	6	9	8	57.12	1.94	127.17	113	5.3
2010	6	16	0	12.74	36.05	70.31	87	4.6
2010	6	16	0	53.1	-1.46	119.35	54	5.2
2010	6	18	23	9.1	13.2	93.09	20	5.9
2010	6	26	9	50.57	-8.02	108.09	90	5.9
2010	6	27	8	47.2	-4.49	101.34	27	5.5
2010	7	20	17	19.02	-29.03	-13.1	10	5.8
2010	7	26	16	37.27	6.8	123.62	606	5
2010	7	26	23	6.97	6.67	123.25	625	5.4
2010	7	29	7	31.68	6.53	123.25	627	6.6
2010	7	30	11	39.54	2.09	126.58	50	5.3
2010	7	30	13	50.32	35.22	59.31	24	5.4
2010	7	31	11	36.65	-0.76	-16.02	10	5.5
2010	8	2	23	13.29	-6.5	104.62	41	5.4
2010	8	3	12	8.59	1.24	126.21	41	6.3
2010	8	9	22	21.32	13.61	92.82	20	5.4
2010	8	21	5	42.28	2.22	96.72	24	6
2010	8	25	8	55.33	-0.76	124.52	42	5.4
2010	8	29	6	37.48	-55.8	-26.99	35	5.4
2010	9	4	11	51.88	-59.08	-25.49	35	5.4
2010	9	5	17	34.66	-0.54	127.48	27	5.6
2010	9	7	0	57.27	-6.91	103.46	10	5.5
2010	9	9	7	28.17	-37.03	-73.41	16	6.2
2010	9	11	11	43.08	7.79	94.06	10	5.8
2010	9	17	3	25.23	-21.59	-67.02	201	5.4
2010	9	17	19	21.5	36.44	70.77	220	6.3
2010	9	17	19	21.51	36.44	70.77	220	6.3
2010	9	27	0	8.59	57.69	-32.76	11	5.5
2010	9	27	11	22.6	29.65	51.67	26	5.8
2010	9	30	9	0.44	19.71	121.47	15	5.8
2010	10	3	15	20.78	34.93	26.54	10	5.3
2010	10	4	1	38.94	19.35	122.16	30	5.5
2010	10	4	13	28.88	24.27	125.15	32	6.3
2010	10	6	21	57.13	6.63	124.84	51	5.5
2010	10	8	5	43.76	2.83	128.23	116	6.1
2010	10	16	15	44.04	-7.37	125.7	8	5.9
2010	10	21	2	49.6	-34.74	-73.72	10	5.9
2010	10	22	19	31.75	-20.88	-68.37	132	5.8
2010	10	23	5	58.77	-37.74	-73.36	15	5.5

2010	10	25	12	5.89	-0.07	125.06	37	5.8
2010	10	25	14	42.21	-3.49	100.08	20	7.8
2010	10	25	14	42.24	-3.49	100.08	20	7.8
2010	10	25	19	37.11	-2.96	100.37	26	6.3
2010	10	25	22	59.33	-3.3	100.46	19	5.9
2010	10	27	18	46.24	-60.49	-24.36	35	5.4
2010	10	28	3	59.21	36.52	71.1	187	5.2
2010	11	5	16	40.69	12.74	123.05	10	5.7
2010	11	10	4	5.41	-45.46	96.39	10	6.5
2010	11	11	18	47.62	-59.55	-26.22	35	5.4
2010	11	14	6	32.79	11.98	43.96	10	5.5
2010	11	14	15	6.06	11.91	43.64	11	5.3
2010	11	14	17	2.76	11.86	43.72	10	5.5
2010	11	16	18	44.83	-3.01	68.12	10	5.5
2010	11	19	21	55.56	1.18	100.12	213	5.7
2010	11	21	12	31.45	23.83	121.66	47	5.6
2010	11	26	12	33.21	28.08	52.57	8	5.5
2010	11	26	22	12.85	-2.62	129.26	28	5.1
2010	11	27	2	44.26	10.29	-43.13	10	5.8
2010	11	27	18	11.35	3.86	128.07	58	5.7
2010	11	29	1	37.26	-17.9	-13.72	10	5.1
2010	11	29	19	57.38	-24.01	-66.71	182	5
2010	11	30	8	39.69	29.79	90.34	10	5.3
2010	11	30	21	19.43	-4.1	79.82	10	5.3
2010	12	1	0	50.16	2.69	99.04	159	5.5
2010	12	6	1	55.38	-8.91	127.08	22	5.1
2010	12	7	4	27.2	-57.93	-7.47	10	5.9
2010	12	8	6	47.47	7.49	126.55	42	5.9
2010	12	8	15	31.58	-6.69	129.9	171	5.5
2010	12	9	4	4.65	-7.15	125.12	537	5
2010	12	9	23	17.29	31.53	70.08	14	5.1
2010	12	10	10	13.34	-37.37	78.08	10	5
2010	12	12	15	59.96	-5.97	117.71	31	5.4
2010	12	13	9	18.23	-6.26	104.01	42	5.7
2010	12	13	13	30.01	-8.09	119.81	191	5.2
2010	12	13	18	51.53	-33.99	-73.08	29	5.4
2010	12	15	4	23.36	-37.31	78.17	10	5.1
2010	12	15	11	29.08	-7.27	128.79	134	6
2010	12	17	13	22.53	-6.48	130	154	5.5
2010	12	18	5	6.16	10.41	126.16	14	5.6
2010	12	20	18	41.59	28.41	59.18	12	6.7
2010	12	21	3	59.83	-8.7	111.2	54	5.6

2010	12	21	14	7.82	2.71	95.89	21	5.9
2010	12	23	16	28.47	-8	119.95	206	5.5
2010	12	27	1	0.43	10.73	-61.63	54	4.7
2010	12	28	2	47.11	-52.92	27.32	10	5
2010	12	30	6	49.8	-56.05	-26.71	38	5
2010	12	31	16	30.45	0.66	-26.05	10	5.3
1911	1	1	1	56.6	39.47	75.25	10	5.1
2011	1	2	15	19.1	-4.46	101.43	21	5.8
2011	1	2	21	10.01	-38.38	-74.33	32	4.9
2011	1	5	10	15.35	-2.65	100	12	5.4
2011	1	6	16	36.2	20.23	-45.74	10	5.2
2011	1	7	1	19.16	20.11	-45.62	10	5.2
2011	1	7	3	9.88	4.24	90.41	17	5.5
2011	1	7	4	55.72	-21.78	-65.34	290	5.1
2011	1	7	9	42.19	-35.74	-73	10	5
2011	1	7	19	28.34	-53.51	25.19	10	5.2
2011	1	8	4	10.66	-0.03	124.91	56	5.6
2011	1	8	8	15.12	-1.15	120.09	10	5
2011	1	11	5	33.38	-35.62	-71.94	35	5
2011	1	12	1	45.56	3.56	126.53	47	5.3
2011	1	15	11	23.32	2.49	96.29	19	5.8
2011	1	17	1	35.17	-21.04	-11.55	10	5.3
2011	1	18	11	33.51	2.63	96.4	21	5.9
2011	1	18	20	23.35	28.78	63.94	68	7.2
2011	1	18	21	30.04	-19.2	-69.4	102	5.3
2011	1	19	9	17.97	41.96	42.66	10	5.2
2011	1	19	21	22.03	-33.9	-72.36	24	5
2011	1	20	3	44.58	-59.94	-27.48	129	5.2
2011	1	22	7	34.74	2.89	95.52	28	5.4
2011	1	22	14	18.61	-4.72	129.22	210	4.8
2011	1	25	5	39.74	-52.91	22.34	10	5
2011	1	26	15	42.95	2.2	96.83	23	6.1
2011	1	29	6	55.61	70.94	-6.68	6	6.2
1911	1	30	2	28.42	12.02	44.07	16	5
2011	2	1	13	39.04	10.62	94.11	21	5.6
2011	2	4	13	53.61	24.62	94.68	85	6.2
2011	2	6	11	21.17	-8.27	104.07	13	5.7
2011	2	6	11	21.61	24.62	94.68	85	6.2
2011	2	10	2	12.02	-27.62	-70.32	61	5.1
2011	2	10	5	35.65	52.13	91.78	10	5.5
2011	2	12	11	55.48	2	126.86	35	5.7
2011	2	13	13	44.64	-36.56	-73.28	18	5.6

2011	2	14	10	21.23	-35.44	-73.1	10	5
2011	2	15	7	18.85	21.1	121.19	32	5.5
2011	2	15	13	33.31	-2.5	121.48	16	6.1
2011	2	18	17	0.89	-33.94	-72.16	10	5.2
2011	2	19	6	26.03	-34.03	-72.23	15	5.2
2011	2	20	9	9.8	13.67	51.64	10	5.2
1911	2	22	2	10.24	14.13	120.65	141	5.2
2011	2	24	4	36.04	-36.27	-73.81	33	5
2011	3	3	15	12.01	9.46	125.94	49	5.5
2011	3	5	9	38.99	-20.25	-69.02	100	4.8
2011	3	6	14	32.6	-56.42	-27.06	87	6.5
2011	3	6	14	32.61	-56.42	-27.06	88	6.5
1911	3	9	13	57.8	8.65	92.41	23	5.3
2011	3	10	17	8.61	-6.87	116.72	510	6.5
2011	3	12	8	45.84	-7.17	129.15	162	4.9
2011	3	17	0	55	-32.5	-71.61	30	5.1
2011	3	17	11	14.66	-32.53	-71.47	39	5
2011	3	18	23	34.97	24.22	125.31	27	5.2
2011	3	19	2	33.47	0.83	97.45	35	5.2
2011	3	19	18	43.32	-10.25	-13.23	10	5.4
2011	3	20	8	0.28	22.34	121.44	35	5.4
2011	3	21	9	49.11	36.49	70.93	190	5.8
2011	3	21	10	36	13.91	120.57	101	5.5
2011	3	22	13	31.71	-33.1	-15.98	5	5.8
2011	3	22	13	31.85	-33.1	-15.98	10	5.9
2011	3	22	19	40.45	-7.61	127.64	149	5
2011	3	28	23	57.47	-33.83	-72.04	11	5.1
2011	3	29	10	48.82	23.19	124.56	10	5.3
2011	4	13	15	14.3	-33.75	-71.84	34	5.1
2011	4	14	16	11.5	5.9	126.24	154	5.2
2011	4	16	1	11.07	25.42	123.89	134	5.8
2011	4	19	0	57.9	-33.36	-72.05	20	5.2
2011	4	19	23	29.41	-44.41	-16.06	16	5.5
2011	4	24	21	9.26	-35.7	-16.99	10	5.6
2011	4	24	22	44.15	-35.42	-16.96	10	5.6
2011	4	24	23	7.17	-4.62	122.76	8	6.1
2011	4	25	0	54.29	36.23	72.18	89	5
2011	4	27	4	57.03	-33.95	-72.5	24	5.1
2011	4	29	7	31.05	-34.06	-72.28	28	5
2011	4	29	8	56.79	4.03	95.76	46	5.4
2011	4	29	13	12.61	21.13	122.01	181	5.3
2011	4	29	20	24.44	-3.53	100.63	24	5.2

2011	5	1	2	31.96	43.56	77.75	23	5.3
2011	5	1	11	6.66	6.55	126.89	83	5
2011	5	4	4	50.58	-49.24	120.72	10	5.1
2011	5	5	8	45.78	-0.16	124.58	60	5
2011	5	6	6	46.35	-0.06	122.97	82	5.5
2011	5	6	16	20.39	32.33	-40.04	9	5.2
2011	5	7	6	57.03	-34.02	-72.32	42	5
2011	5	7	12	3.58	-23.9	69.5	10	5
2011	5	8	15	51.88	1.07	125.31	85	4.9
2011	5	10	14	32.62	1.47	126.36	41	5.2
2011	5	11	1	28.83	6.04	125.95	110	4.9
2011	5	11	7	54.12	1.53	127.25	107	5.2
2011	5	11	16	47.57	37.7	-1.67	1	5.1
2011	5	13	21	43.04	-9.98	107.65	10	5.3
2011	5	15	13	8.3	0.57	-25.65	10	6.1
2011	5	19	17	5.15	-34.68	-71.48	44	5.2
2011	5	21	0	16.55	-56.07	-27.11	48	5.9
2011	5	21	13	8.44	17.19	121.72	35	5.3
2011	5	21	23	45.49	-19.82	-68.93	98	5
2011	5	22	1	34.23	24.09	121.76	5	5
2011	5	22	16	42.44	13.6	120.75	148	5.7
2011	5	24	8	11.09	-5.27	102.42	39	5
2011	5	25	12	28.56	-34.73	-15.09	10	5
2011	5	27	20	27.38	-12.72	66.34	15	5.1
2011	5	27	21	1.08	-7.1	103.41	35	5
2011	5	28	20	17.29	4.69	127.67	85	5.4
2011	5	29	13	44.11	-6.6	129.79	149	5.2
2011	5	29	18	24.01	-7.72	101.76	13	5.9
2011	6	2	12	30.71	-11.7	-13.21	10	5.2
2011	6	2	17	7.39	22.24	121.41	42	5
2011	6	3	7	27.18	9.64	92.46	45	5.5
2011	6	3	14	36.06	-55.66	-25.56	10	5
2011	6	7	5	11.18	-44.44	-15.81	10	5.4
2011	6	8	1	53.6	43.01	88.25	21	5.3
2011	6	8	4	41.03	-34.03	-72.2	23	4.9
2011	6	8	16	32.84	1.17	96.78	20	5.3
2011	6	11	11	21.18	-58.28	-14.02	10	5.4
2011	6	12	15	37.41	13.42	41.69	1	5.1
2011	6	12	19	21.08	13.3	41.8	10	5
2011	6	13	14	31.29	2.52	126.46	61	6.3
2011	6	13	18	47.43	-56.12	-27.33	94	5.1
2011	6	14	0	8.51	1.86	99.23	35	5.5

2011	6	17	22	8.99	-23.88	69.53	10	5.4
2011	6	19	4	15.89	-3.25	101.36	57	5.4
2011	6	20	16	36.11	-21.7	-68.23	128	6.4
2011	6	21	16	25.9	-1.84	100.14	41	5.1
2011	6	22	13	57.12	-27.96	-66.56	163	5.3
2011	6	27	16	47.42	-8.93	122.47	119	5.5
2011	6	28	9	50.54	4.68	125.23	51	5.2
2011	6	29	5	36.04	-33.91	-72.34	19	5.5
2011	6	30	13	37.62	-7.11	68	10	5.2
2011	7	1	2	38.94	0.94	121.74	59	5
2011	7	4	19	0.75	1.42	97.17	38	5.2
2011	7	8	5	53.38	0.96	-26.42	10	5.6
2011	7	9	19	2.5	-7.38	128.65	150	5
2011	7	10	16	42.75	9.53	122.26	10	5.1
2011	7	11	21	3.02	9.67	122.28	10	5.1
2011	7	11	22	49.55	9.58	122.26	10	5.1
2011	7	13	7	19.12	25.08	123.68	121	5.2
2011	7	15	13	26.29	-60.76	-23.52	10	6.1
2011	7	16	0	26.26	-33.82	-71.83	20	6
2011	7	24	8	23.63	-7.2	106.46	59	5.1
2011	7	24	10	38.05	28.27	66.37	10	5
2011	8	3	14	35.12	-3.41	100.19	14	5.2
2011	8	4	0	16.74	-2.83	101.1	35	5.8
2011	8	6	2	45.55	-2.91	101.09	44	5.3
2011	8	9	4	43.41	-4.25	102.4	64	5
2011	9	3	4	48.71	-56.45	-26.85	84	6.4
2011	9	5	17	55.11	2.96	97.89	91	6.7
2011	11	21	3	15.11	24.96	95.23	107	5.7
2011	11	29	0	30.91	-1.6	-15.45	10	5.9
2011	11	30	19	42.21	7.8	93.84	6	5.6
2011	12	11	9	54.51	-56.01	-28.18	116	6.2
2012	1	12	14	11.81	-52.11	28.15	10	5.5
2012	2	26	6	17.91	51.71	95.99	12	6.7
2012	4	17	19	3.61	-59.02	-16.61	12	6.2
2012	5	9	14	49.11	-0.97	-13.6	12	5.5
2012	9	3	18	23.51	-10.71	113.93	14	6.1
2013	6	16	2	51.51	-56.28	-27.44	91	5.5
2013	6	24	22	4.31	10.7	-42.59	10	6.6
2013	8	11	21	23.13	30.05	97.96	6	5.7
2013	8	17	16	32.14	-34.89	54.09	10	6.1
2013	8	25	16	7.46	-33.46	57.04	5	5.8
2013	8	31	0	4.77	28.24	99.35	8	5.6

2013	9	3	0	41.71	-33.78	56.09	10	5.3
2013	9	5	4	1.63	15.18	-45.23	10	6
2013	9	6	2	28.01	-47.04	33.48	10	5.6
2013	9	19	21	37.41	37.75	101.51	21	5
2013	9	20	12	24.62	22.93	95.96	4	5.7
2013	9	21	1	39.55	-7.33	120.01	550	6.1
2013	9	24	11	36.76	27.21	65.57	10	5.8
2013	9	24	17	20.35	27.13	65.47	11	5.5
2013	9	28	7	34.64	27.18	65.51	12	6.8
2013	10	2	1	6.73	11.23	57.59	8	5.7
2013	10	4	17	26.36	-38.61	78.37	13	6.4
2013	10	12	13	11.33	35.51	23.25	40	6.6
2013	10	12	20	1.7	-36.74	78.72	4	5.5
2013	10	13	17	32.56	3.96	95.86	46	5.6
2013	11	8	9	51.15	-1.19	67.68	10	5.5
2013	11	13	23	45.79	-60.28	-47.12	11	6.1
2013	11	16	3	34.12	-60.26	-47.06	10	6.9
2013	11	16	15	0.25	-60.35	-46.37	10	5.5
2013	11	22	6	51.5	34.46	45.48	6	5.6
2013	11	22	17	20.83	5.42	92.82	16	5.5
2013	11	22	18	30.8	34.31	45.61	14	5.8
2013	11	25	6	27.33	-53.95	-55	12	7
2013	11	28	13	51.03	29.32	51.31	8	5.8
2013	12	1	6	29.57	2.04	96.83	20	6
2013	12	2	12	18.82	-53.31	25.5	10	5.5
2013	12	22	7	29.39	-46.45	96.13	10	5.5
2013	12	22	10	3.97	-46.44	96.02	10	5.6
2013	12	28	15	21.4	36.03	31.31	41	5.9
2013	12	28	18	59.48	-1.37	-15.17	10	5.8
2014	1	25	5	14.85	-7.99	109.27	66	6.1
2014	1	26	13	57.92	38.29	20.56	10	5.6
2014	2	1	3	58.39	-56.83	-27.34	130	6.1
2014	2	3	3	8.61	38.26	20.39	5	6
2014	2	8	19	50.64	-60.43	-45.19	24	5.7
2014	2	12	9	24.3	35.82	82.47	10	5.7
2014	2	22	22	39.22	-60.24	-47.27	10	5.5
2014	3	11	2	44.58	-60.86	-19.98	10	6.4
2014	3	14	13	38.06	7.76	94.31	10	5.5
2014	3	17	13	24.89	-53.17	-32.32	6	5.6
2014	3	19	20	17.35	-60.73	-25.33	10	5.5
2014	3	29	7	46.01	-0.85	-21.92	12	5.9
2014	4	3	9	30.49	-5.24	102.28	44	5.9

2014	4	4	20	8.69	37.28	23.87	107	5.6
2014	4	15	3	57.13	-53.5	8.72	11	6.8
2014	5	1	14	35.7	1.96	97.97	37	5.9
2014	5	5	11	8.34	19.66	99.67	6	6.1
2014	5	11	12	35.74	-47.85	99.69	10	5.8
2014	5	18	1	2.26	4.25	92.76	35	6
2014	5	21	16	21.43	18.2	88.04	47	6
2014	5	22	8	37.65	-55.4	-28.28	7	5.5
2014	5	23	20	49.19	24.97	97.84	8	5.8
2014	5	24	9	25.24	40.29	25.39	6	6.9
2014	5	30	1	20.51	25	97.85	10	5.9
2014	6	1	10	7.25	2.02	89.78	20	5.7
2014	6	13	19	30.96	-46.03	-13.88	6	5.8
2014	6	14	3	58.16	36.45	70.72	200	5.6
2014	6	14	11	10.98	-10.12	91.09	4	6.5
2014	6	29	7	52.51	-55.47	-28.37	8	6.9
2014	6	30	1	46.29	0.05	-17.34	10	5.6
2014	7	5	9	39.77	1.93	96.94	20	6
2014	7	19	14	14.18	11.74	57.64	10	6
2014	7	26	11	13.81	-60.04	-18.67	10	5.8
2014	7	27	1	28.74	23.72	-45.59	10	6
2014	7	31	13	41.01	12.43	95.24	10	5.8
2014	8	1	4	11.68	36.85	3.16	10	5.5
2014	8	3	8	30.35	27.19	103.41	12	6.2
2014	8	18	2	32.53	32.7	47.69	10	6.2
2014	8	18	18	8.27	32.58	47.7	5	6
2014	8	20	10	14.15	32.64	47.74	18	5.6
2014	8	29	3	45.07	36.69	23.71	80	5.8
2014	9	22	16	1.25	-56.01	-27.82	112	5.6
2014	9	29	13	43.11	64.5	-17.31	10	5.6
2014	9	30	16	45.62	1.64	67.69	10	5.5
2014	10	7	13	49.4	23.39	100.49	11	6
2014	10	8	3	4.81	30.31	41.89	10	5.6
2014	10	15	11	16.31	64.48	-18	10	5.5
2014	10	15	13	35.27	32.52	47.78	10	5.5
2014	10	30	12	11.51	-6.98	117.58	535	5.7
2014	11	7	0	20.71	4.78	95.07	39	5.5
2014	11	17	16	52.61	-46.35	33.8	10	6.1
2014	11	18	3	25.71	7.48	94.35	6	5.6
2014	11	20	18	14.71	23.51	93.51	49	5.6
2014	11	22	8	55.61	30.34	101.73	9	5.9
2014	11	22	19	14.61	45.89	27.15	32	5.6

2014	11	25	15	19.81	30.18	101.76	9	5.6
2014	12	5	18	43.61	23.33	100.47	11	5.6
2014	12	6	10	20.11	23.35	100.53	10	5.6
2014	12	17	6	10.51	-3.82	100.14	10	5.9
2014	12	29	17	41.91	-56.65	-24.85	19	5.6
2015	1	2	8	21.51	6.57	60.37	10	5.5
2015	1	10	2	5.61	-5.65	68.36	10	5.6
2015	2	1	20	2.11	-49.31	-8.12	10	5.6
2015	2	13	18	59.22	52.64	-31.9	16	7.1
2015	2	16	22	0.31	-55.2	-28.25	13	6.2
2015	3	3	10	37.01	-0.77	98.71	28	6.1
2015	3	6	8	22.81	-41.31	80.6	10	6
2015	3	30	10	34.31	-39.28	78.09	10	5.9
2015	4	10	16	23.41	-13.79	65.85	10	5.7
2015	4	16	18	35.18	26.82	35.18	20	6
2015	4	25	6	45.05	28.22	84.82	10	6.6
2015	4	26	7	9.1	27.77	86.01	22	6.7
2015	4	26	7	9.01	27.77	86.01	22	6.7
2015	4	30	10	19.81	-60.39	-26.9	10	5.8
2015	5	5	20	53.01	-15.38	67.21	10	5.5
2015	5	8	3	12.11	1.54	97.9	36	5.7
2015	5	15	20	26.61	-2.54	102.21	151	6
2015	5	16	11	27.61	27.56	86.07	7	5.5
2015	5	18	4	2.61	-41.56	80.32	9	5.7
2015	5	24	4	11.11	-16.85	-14.17	11	5.5
2015	5	24	21	11.11	-59.65	-26.45	34	5.5
2015	6	4	23	15.31	5.99	116.54	10	6
2015	6	5	14	54.01	-37.17	78.18	10	5.6
2015	6	17	12	11.11	-35.36	-17.16	11	5.5
2015	6	29	22	11.11	36.68	71.3	19	5.5
2015	7	3	1	7.71	37.46	78.15	20	6.4
2015	7	26	7	11.11	-92.58	111.26	52	5.5
2015	8	10	10	11.11	36.53	71.21	224	5.5
2015	8	13	10	39.31	-37.01	78.06	10	6
2015	8	13	11	28.51	-36.85	78.35	10	5.6
2015	8	17	16	16.91	13.71	51.78	10	5.7
2015	8	26	13	51.51	-57.5	-25.88	32	5.8
2015	9	18	15	59.21	15.28	-45.99	10	6
2015	9	30	16	11.11	-56.19	-27.71	111	5.5
2015	10	23	0	27.91	29.64	70.33	11	5.6
2015	10	23	1	40.61	-54.23	6.16	11	6.2
2015	10	23	4	11.11	-45.81	37.17	11	5.5

2017	2	7	22	3.64	25.191	63.264	29	6.3
2017	3	2	11	7.69	37.616	38.431	10	5.6
2017	3	7	15	45.93	-6.261	102.187	10	5.5
2017	3	14	2	50.67	6.146	92.304	10	6
2017	3	21	23	10.51	-8.492	115.323	111	5.6
2017	4	5	6	9.22	35.776	60.436	13	6.1
2017	4	16	9	44.58	-7.372	83.172	10	5.6
2017	5	2	15	10.24	-11.712	-13.938	10	5.9
2017	5	3	4	47.33	39.494	71.444	11	6
2017	5	5	5	9.59	39.479	71.422	10	5.8
2017	5	6	0	15.53	-60.827	-38.016	12	5.9
2017	5	10	23	23.68	-56.414	-25.743	15	6.5
2017	5	11	15	41.16	-56.584	-25.844	13	5.7
2017	5	13	18	0.87	37.769	57.206	8	5.6
2017	5	30	11	29.18	-58.628	-26.242	76	5.7
2017	6	11	23	15.61	-8.321	106.259	7	5.7
2017	6	12	12	28.91	38.93	26.365	12	6.3
2017	6	24	7	27.77	-41.238	80.638	10	5.5
2017	6	25	3	1.91	-9.54	66.17	10	5.6
2017	6	30	1	34.07	33.741	-38.544	10	5.9
2017	7	19	12	16.35	-17.415	66.484	10	6
2017	7	20	22	31.12	36.929	27.414	7	6.6
2017	7	27	17	53.46	13.396	-49.326	10	6
2017	8	6	19	32.62	-47.288	99.867	10	5.6
2017	8	8	13	19.95	33.193	103.855	9	6.5
2017	8	8	23	27.3	44.302	82.832	20	6.3
2017	8	10	9	51.1	-25.009	-13.6	10	5.5
2017	8	13	3	8.05	-3.768	101.623	31	6.4
2017	8	18	2	59.56	-1.112	-13.661	35	6.6
2017	8	31	17	6.57	-1.159	99.688	43	6.3
2017	9	1	11	7.7	57.058	-34.071	10	5.5
2017	9	4	8	7.45	-57.739	-25.613	25	6.1
2017	9	10	21	40.05	57.132	-33.652	10	5.7
2017	9	15	18	48.25	-55.444	-28.362	9	5.5
2017	9	18	5	28.3	-18.546	-12.696	10	5.5
2017	10	3	20	39.47	13.459	-49.332	10	5.7
2017	10	6	2	3.83	0.956	-25.509	10	5.5
2017	10	6	17	41.31	-35.31	-15.552	10	5.6
2017	10	10	18	53.78	-54.263	8.609	9	6.7
2017	10	11	0	8.63	-54.259	8.336	10	5.6
2017	10	23	8	32.25	-52.344	16.781	10	5.8
2017	10	28	16	13.43	86.875	54.151	10	5.8

2017	10	28	16	16.69	86.897	53.211	10	5.8
2017	10	28	19	11.27	86.923	55.2	10	5.9
2017	11	11	0	36.49	-11.742	-14.114	10	6.1
2017	11	12	18	18.71	34.911	45.959	19	7.3
2017	11	15	2	2.52	-59.031	-17.101	10	5.6
2017	11	17	22	34.94	29.833	94.984	8	6.4
2017	11	28	13	15.54	72.599	3.275	10	5.5
2017	11	29	3	35.5	-25.643	-13.864	10	5.5
2017	11	30	6	32.07	-1.08	-23.432	10	6.5
2017	12	1	2	32.6	30.746	57.307	9	6.1
2017	12	12	8	43.83	30.737	57.279	12	6
2017	12	12	21	41.11	30.828	57.298	8	6
2017	12	13	18	3.39	-54.219	2.163	17	6.5
2017	12	15	16	47.82	-7.492	108.174	90	6.5
2017	12	25	12	2.63	-27.885	74.005	10	5.5
2018	1	7	6	47.58	24.738	94.906	33	5.6
2018	1	11	6	59.04	33.713	45.724	10	5.5
2018	1	11	18	26.42	18.372	96.072	9	6
2018	1	23	6	34.49	-7.092	105.963	48	5.9
2018	1	25	1	15.83	8.253	91.766	10	5.8
2018	1	28	16	3.39	-53.062	9.684	10	6.6
2018	1	31	7	6.94	36.526	70.851	193	6.2
2018	2	8	2	29.69	79.764	2.941	10	5.7
2018	2	15	8	27.2	-0.068	-17.841	10	5.6
2018	3	10	14	27.26	-56.364	-27.864	10	5.5
2018	3	10	21	45.63	-1.423	-15.21	10	5.9
2018	3	17	5	50.9	-47.679	-13.509	10	5.7
2018	3	23	7	40.9	12.653	-44.569	10	5.6
2018	3	24	19	58.33	-45.778	96.069	10	6
2018	4	9	0	20.55	-57.659	-27.899	245	5.6
2018	4	19	6	34.68	28.329	51.611	10	5.5
2018	4	19	21	9.47	-42.78	42.188	10	6
2018	4	29	22	23.59	-39.265	46.12	10	5.9
2018	5	9	10	41.59	36.994	71.382	116	6.2
2018	5	14	18	14.73	-55.916	-27.056	10	5.5
2018	5	23	5	44.38	7.441	-36.238	10	5.7
2018	5	24	23	11.71	0.817	-29.54	10	5.6
2018	6	6	18	51.45	-58.36	-25.756	31	5.6
2018	6	12	23	8.83	-2.02	98.588	9	5.9
2018	6	13	6	59.26	-1.931	98.641	19	5.5
2018	6	14	18	12.56	0.854	-26.126	10	5.5
2018	6	25	5	14.49	36.64	21.343	10	5.5

2018	6	26	1	48.31	-59.535	-29.662	25	5.6
2018	7	10	10	26.23	-31.599	58.346	10	5.6
2018	7	10	16	5.97	-31.592	58.152	10	5.6
2018	7	21	20	56.99	-48.225	99.645	10	5.9
2018	7	22	10	7.13	34.591	46.166	12	5.8
2018	7	22	20	39.73	30.431	57.453	10	5.6
2018	7	23	10	35.95	-0.299	-19.252	10	6
2018	7	25	19	44.74	-56.062	-27.681	124	5.7
2018	7	28	22	47.87	-8.239	116.508	14	6.4
2018	8	3	18	50.38	-0.871	-21.996	10	5.8
2018	8	5	11	46.86	-8.258	116.438	34	6.9
2018	8	7	13	56.03	74.646	8.455	10	5.7
2018	8	9	5	25.23	-8.306	116.23	15	5.9
2018	8	9	16	53.95	-33.354	2.482	10	5.6
2018	8	14	3	29.21	-58.134	-25.273	25	6.1
2018	8	19	4	10.26	-8.337	116.599	16	6.3
2018	8	19	14	56.75	-8.319	116.627	21	6.9
2018	8	22	20	26.9	-52.734	27.901	10	5.6
2018	8	25	22	13.56	34.611	46.242	10	6
2018	9	3	20	35.01	-58.012	-25.263	29	5.6
2018	9	3	21	52.62	39.394	76.878	10	5.5
2018	9	5	0	36.31	-58.318	-24.932	10	5.6
2018	9	7	6	23.86	28.326	59.32	10	5.6
2018	9	8	2	31.07	23.332	101.578	8	5.7
2018	9	18	7	27.13	-37.813	49.776	10	6
2018	9	27	10	25.75	-58.185	-9.59	10	5.8
2018	9	28	6	21.49	-26.493	67.589	10	5.6
2018	9	28	7	6.66	-26.513	67.62	10	5.7
2018	10	5	14	59.41	-5.691	-11.525	10	5.8
2018	10	7	0	10.48	7.661	-37.708	10	5.8
2018	10	10	18	44.53	-7.452	114.455	9	6
2018	10	14	5	5.44	-41.938	88.505	10	5.7
2018	10	14	12	41.44	-42.292	88.693	10	5.9
2018	10	16	8	35.33	0.95	-28.219	10	5.5
2018	10	17	3	57.46	-43.62	-16.332	10	5.5
2018	10	21	1	40.79	-29.536	60.752	10	5.8
2018	10	25	22	54.26	37.52	20.556	14	6.8
2018	10	28	0	37.73	45.657	26.397	151	5.5
2018	10	30	15	12.06	37.512	20.508	11	5.7
2018	11	1	19	29.47	-58.074	-25.206	29	5.8
2018	11	9	1	49.86	71.631	-11.243	10	6.7
2018	11	11	14	3.95	15.565	-49.872	10	6.3

2018	11	15	20	2.29	-56.706	-25.546	15	6.4
2018	11	25	16	37.28	34.361	45.744	18	6.3
2018	11	25	23	57.57	23.404	118.579	16	5.7
2018	11	29	20	21.46	0.225	96.998	9	5.8
2018	12	11	2	26.47	-58.538	-26.396	133	7.1
2018	12	16	14	26.96	-23.323	112.498	10	5.8
2018	12	19	3	38.2	30.555	-41.84	10	5.7
2018	12	23	19	32.17	30.408	87.62	10	5.8
2018	12	30	8	39.24	-2.677	102.349	166	5.7
1994	5	24	2	5.62	38.66	26.54	17	5.5
1994	5	25	7	38.37	27.65	87.79	47	4.6
1994	5	25	18	42.93	7.65	94.28	24	5.9
1994	5	25	21	9.83	5.41	61.32	10	5.1
1994	5	25	21	14.26	5.59	61.19	10	5.2
1994	5	26	8	26.24	35.31	-4.1	9	6
1994	5	29	14	11.09	20.56	94.16	35	6.5
1994	6	2	18	17.4	-10.48	112.83	18	7.8
1994	6	3	4	54	-10.39	113	42	5.6
1994	6	3	16	33.05	-9.44	113.04	28	5.3
1994	6	3	21	6.98	-10.36	112.89	25	6.6
1994	6	3	22	40.12	28.74	70.07	33	5.9
1994	6	4	0	57.06	-10.78	113.37	11	6.5
1994	6	4	12	4.78	-10.7	113.56	28	5.2
1994	6	4	20	9.34	-10.83	113.2	30	5.5
1994	6	5	1	9.01	24.51	121.9	11	6.4
1994	6	5	17	51.7	-10.65	112.65	39	5.5
1994	6	9	16	22.2	13.26	124.28	75	6.2
1994	6	9	20	36	36.94	71.32	87	5.4
1994	6	10	3	0.45	38.56	70.63	33	5.4
1994	6	10	19	17.22	-10.29	113.5	33	5.4
1994	6	12	1	35.21	-10.46	112.83	33	5.1
1994	6	12	1	47.91	-10.57	112.78	33	5.3
1994	6	13	21	4.94	-10.28	113.49	23	5.6
1994	6	13	22	48.75	-10.33	113.62	25	5.6
1994	6	14	15	20.12	-10.51	113.48	27	5.2
1994	6	14	21	1.54	1.52	126.31	33	5.6
1994	6	15	9	22.72	-10.34	113.66	19	6.2
1994	6	15	10	28.5	-10.17	113.75	28	6.1
1994	6	15	12	10.64	-10.5	113.44	24	5.2
1994	6	15	13	53.3	-10.38	112.44	31	5
1994	6	17	5	15.09	14.47	54.53	10	5
1994	6	18	22	38.01	-10.15	113.63	46	5.5

1994	6	20	9	9.29	28.97	52.61	8	5.9
1994	6	25	13	54.88	-56.07	-27.67	110	5.1
1994	6	27	12	3	-16.12	67.48	10	5.4
1994	6	29	18	22.35	32.57	93.67	9	5.9
1994	6	30	9	23.13	36.33	71.13	226	6.3
1994	7	1	10	12.12	40.23	53.38	40	5.6
1994	7	3	21	44.46	-48.22	31.54	10	5.4
1994	7	5	10	9.26	10.43	125.32	29	5.9
1994	7	5	13	31.17	-12.15	65.67	10	5.5
1994	7	6	9	13.01	5.98	125.93	151	5.9
1994	7	8	17	10.42	0.26	66.74	10	5.4
1994	7	8	20	32.95	-28.85	75.31	10	5.2
1994	7	16	18	5.05	-4.62	125.61	442	5.7
1994	7	18	16	33.98	-9.59	112.94	33	5.5
1994	7	19	16	18.34	10.2	125.19	20	5.3
1994	7	23	20	57.9	31.07	86.55	15	5.4
1994	7	24	14	47.8	37.01	71.66	119	5.3
1994	7	24	21	57.27	-10.65	113.27	34	5.4
1994	7	28	8	3.18	-47.28	100.22	10	5.8
1994	8	7	5	52.76	-10.27	119.98	25	5.2
1994	8	8	21	8.16	24.72	95.2	121	6.1
1994	8	10	1	39.29	10.52	94.36	33	5.4
1994	8	18	1	13.57	35.52	-0.11	8	5.9
1994	8	19	21	2.56	17.97	96.42	12	5.8
1994	8	21	15	55.92	56.76	117.9	12	6
1994	8	24	15	17.03	-25.08	-13.59	10	5.3
1994	8	28	15	41.92	5.66	126.23	68	5.6
1994	8	29	17	36.08	-0.4	-19.17	10	5.8
1994	8	30	19	42.65	-6.97	124.11	595	6.2
1994	9	1	16	12.07	41.18	21.2	14	5.6
1994	9	8	8	50.23	0.54	126.17	52	5.7
1994	9	12	11	30.49	-8.91	106.48	33	5.7
1994	9	15	23	47.3	-57.8	-8.77	10	6
1994	9	16	6	20.87	22.53	118.71	13	6.8
1994	9	16	8	15.58	-5.35	102.83	33	5.4
1994	9	28	16	39.16	-5.79	110.35	637	6.6
1994	9	28	17	33.82	-5.73	110.36	628	6
1994	10	5	1	13.73	23.1	121.48	69	5.5
1994	10	14	10	16.29	22.4	121.64	140	5.2
1994	10	21	5	6.1	36.39	69.71	47	5.5
1994	10	25	0	54.34	36.36	70.96	238	6
1994	10	25	4	37.5	1.83	126.02	40	5.5

1994	10	28	23	51.22	24.76	122.21	33	5.6
1994	10	31	11	48.39	3.02	96.19	29	6.2
1994	11	2	1	43.55	5.1	118.64	55	5.7
1994	11	14	11	27.61	-0.03	-16.93	10	5.3
1994	11	14	19	15.06	13.52	121.07	31	7.1
1994	11	15	6	25.09	13.14	121.18	21	5.5
1994	11	15	20	18.13	-5.59	110.19	560	6.5
1994	11	16	21	34.2	-10.18	-13.26	10	5.3
1994	11	18	1	13.02	13.06	121.09	19	5.4
1994	11	20	18	34.44	4.33	97.59	153	6.1
1994	11	21	8	16.4	25.54	96.66	14	5.9
1994	12	8	8	30.26	1.97	120.84	38	5.7
1994	12	10	1	54.64	-56.2	-27.17	110	5.2
1994	12	10	12	16.11	27.91	64.99	56	5.2
1994	12	12	14	52.33	-9.98	119.2	25	5.6
1994	12	12	21	49.57	-38.98	46.59	10	5.4
1994	12	31	2	57.08	20.52	109.33	33	5.3
1995	1	3	2	54.69	-56.21	-27.28	130	5.3
1995	1	3	16	11.7	-57.7	-65.88	13	5.9
1995	1	6	18	1.28	-56.5	-25.32	33	5.5
1995	1	20	15	49.22	1.18	126	56	5.9
1995	1	29	1	20.08	36.92	71.64	109	5.3
1995	2	2	12	53.31	10.74	-42.56	10	5.8
1995	2	17	2	44.5	27.64	92.37	39	5.5
1995	2	20	4	12.32	39.17	71.12	25	5.3
1995	2	23	5	19.19	24.14	121.61	40	6.2
1995	2	23	21	3.13	35.05	32.28	10	5.9
1995	3	4	17	56.8	-13.97	-14.49	10	5.4
1995	3	6	18	43.01	2.69	118.23	16	6.1
1995	3	9	7	4.21	78.3	2.3	10	5.1
1995	3	14	10	27.07	3.05	95.85	30	5.5
1995	3	15	2	31.19	15.06	118.65	26	5.4
1995	3	26	2	16.25	-55.95	-28.21	48	6.3
1995	4	3	11	54.35	24.07	122.29	33	5.7
1995	4	4	7	10.56	33.75	-38.62	10	5.8
1995	4	17	7	14.52	33.76	-38.58	10	6.2
1995	4	21	0	2.84	11.97	125.69	27	6
1995	4	21	5	17.13	12.05	125.92	27	6.8
1995	4	23	5	8.19	12.39	125.4	24	6.8
1995	4	23	6	38.11	5.95	123.82	530	6.1
1995	5	2	11	48.16	43.78	84.66	33	5.5
1995	5	5	3	11.34	1.49	127.31	144	4.9

1995	5	5	4	39.06	12.64	125.24	33	6.1
1995	5	5	13	1.14	-9.9	118.92	33	5.7
1995	5	5	17	19.93	-8.73	111.03	76	5.9
1995	5	6	1	59.71	24.99	95.29	117	6.4
1995	5	8	18	5	11.53	126.06	35	5.5
1995	5	13	8	47.27	40.15	21.69	14	6.6
1995	5	13	21	0.61	-5.3	108.9	576	5.9
1995	5	14	11	33.88	-8.38	125.13	11	6.9
1995	5	14	22	33.72	39.79	77.58	33	5.1
1995	5	15	15	26.39	-56.04	-27.81	100	5.2
1995	5	16	3	35.26	36.46	70.89	186	5.9
1995	5	18	0	6.74	-0.89	-22	12	6.8
1995	5	20	13	45.27	-56.03	-27.74	100	5.5
1995	5	23	22	10.18	-55.94	-3.36	10	6.8

A-6: P-model Station Terms

Table **A-6**: Station IDs, latitude, longitude and station terms for the P-wave tomography model.

Station ID	Latitude	Longitude	Station Term (s)
103B	-9.7159	34.1118	0.006430
104	-9.7986	34.1565	0.300615
105	-9.8808	34.2049	0.287450
106	-9.9636	34.2504	0.279662
107	-10.0484	34.2981	0.341630
109	-10.2180	34.3922	0.431437
110B	-10.3224	34.3960	0.081585
111	-10.4263	34.4103	0.408520
112	-10.5291	34.4035	0.382563
114	-10.7366	34.4101	0.367297
115	-10.8407	34.4136	0.370280
116	-10.9653	34.4190	0.364210
118B	-11.2140	34.4297	0.065628
119	-11.3357	34.4437	0.319305
120	-11.4558	34.4369	0.264487
121	-11.5987	34.4413	0.220417
122	-11.6475	34.4483	0.205030
202	-10.0651	34.1113	0.161793
203B	-10.0314	34.1577	0.009118
204	-9.9974	34.2036	0.297003
206B	-9.9119	34.3199	0.051428
301	-10.8588	34.2593	0.323703
302B	-10.8528	34.3080	0.056833
303	-10.8474	34.3593	0.406045
305	-10.8291	34.5229	0.347165
306	-10.8247	34.5794	0.313848
AMBA	-8.1060	33.2588	-0.075783
AMDT	1.9487	34.9358	-0.038403
ANGA	-2.5000	36.8000	0.066623
BAKO	-8.8437	34.8016	-0.114300
BANG	-10.1128	35.6506	-0.092370
BARI	0.4662	35.9806	0.102422
BASO	-4.3238	35.1382	-0.020133
BEND	0.5810	31.3920	-0.022385
BIHA	-2.6380	31.3160	-0.047595

BKBA	-1.3640	31.8120	-0.028860
BLWY	-20.1430	28.6113	-0.322443
BOBN	-1.6600	29.2367	-0.020275
BOKO	-2.2557	37.7299	0.031708
BOLE	-10.9796	33.7426	-0.123040
BUMI	-10.1277	34.9365	-0.190263
BUTI	1.8190	31.3260	0.127867
CHAL	-6.6400	38.3700	-0.054410
CHAM	-10.9500	31.0700	-0.111320
CHEL	-10.5869	33.8097	-0.072543
CHIM	-8.8300	34.0300	-0.089690
CHML	-8.8263	34.0284	-0.104597
CHUN	-8.5434	33.4337	-0.073415
CPMW	-9.7057	33.2692	-0.020263
CRTR	-9.3318	33.7512	0.023445
DESE	11.1180	39.6350	0.283158
DODT	-6.1860	35.7480	-0.075978
ENUK	-11.1799	33.8859	-0.115047
FOPO	0.6630	30.2820	-0.018895
GAWA	-8.7648	34.3864	-0.121442
GEIT	-2.8810	32.2170	-0.077920
GOMA	-4.8392	29.6927	-0.113687
GULU	2.8778	32.2848	-0.123575
HALE	-5.3018	38.6170	-0.018963
HAMA	-3.8320	32.6420	-0.030968
IFAK	-8.1400	36.6800	-0.094710
IGOM	-9.0019	33.6581	0.046535
ILIN	-9.0819	33.3327	0.013870
ILOM	-9.2829	33.3421	0.014185
INDI	-10.0200	39.7100	-0.189025
INZA	-5.1168	30.3988	-0.122118
IRIN	-7.7600	35.6900	-0.072258
ISOK	-9.5090	33.4944	-0.045895
ITUM	-9.4005	33.1880	-0.036088
JILO	-8.7261	33.5664	-0.023495
JNJA	0.4460	33.1820	-0.032333
JSOK	-10.1708	32.6457	-0.033645
KABG	3.5104	34.1433	-0.034415
KAKA	0.5587	34.7963	-0.027935
KALO	-9.9111	33.6448	-0.053393
KAMZ	-14.7948	24.8044	-0.172873
KAPK	-9.7801	33.4574	-0.043008

KAPO	-9.7851	33.8208	-0.080418
KARM	-9.9541	33.8954	-0.086145
KASM	-10.2200	31.1400	-0.105695
KATE	-0.1380	29.8710	0.053495
KBLE	-1.2540	29.9920	0.069363
KGMA	-4.8780	29.6330	-0.042713
KIBA	-5.3223	36.5695	-0.038505
KIBE	-5.3775	37.4763	-0.020513
KIBO	-3.5830	30.7130	-0.020350
KIDE	-9.2745	35.0214	-0.153048
KIFA	-9.5472	35.1026	-0.144162
KIMA	-8.9200	39.5100	-0.063698
KIMO	-10.6922	36.0463	-0.191557
KIPE	-9.2891	34.4382	-0.116212
KISH	-12.0200	29.6100	-0.168712
KISZ	-12.1116	25.4952	-0.081080
KITG	3.2920	32.8798	-0.097460
KITU	-1.3730	38.0021	0.088858
KMBO	-1.1270	37.2500	0.064840
KMPZ	-13.4568	25.8337	-0.169708
KOMO	-3.8422	36.7192	-0.027633
KOND	-4.9040	35.7965	-0.009445
KOTD	3.0002	34.1104	-0.091848
KR03	-0.2928	35.1650	-0.392867
KR05	0.5833	35.4960	0.185652
KR07	-0.2413	35.7458	0.036348
KR08	0.5675	35.7095	0.261030
KR09	-0.3687	35.9230	-0.426598
KR12	-0.1012	35.9387	0.230225
KR16	0.4020	36.2905	0.036978
KR17	-0.8508	36.3683	-0.060320
KR22	0.2238	36.5833	0.150867
KR24	-0.1680	36.6305	0.048010
KR27	-0.1335	36.8883	0.185218
KR29	-0.0348	37.0300	0.327147
KR30	-1.0245	37.1637	-0.121710
KR31	-0.0678	37.2455	-0.154150
KR32	0.3568	37.5497	-0.014780
KR35	0.2867	37.8835	0.047028
KR42	0.0380	35.7263	0.207220
KT01	-1.4387	36.6545	0.153073
KT02	-1.4913	36.4748	0.112195

KT03	-1.3477	36.1352	0.158110
KT04	-1.4467	35.8430	0.047810
KT05	-1.0485	36.5875	0.196272
KT06	-1.0528	36.2956	0.197030
KT07	-1.1507	35.9158	0.123525
KT08	-0.8072	36.6783	0.171935
KT09	-0.7862	36.2823	0.151190
KT10	-0.7422	35.9733	0.256043
KT11	-0.8177	35.9008	0.233387
KT13	-0.4608	36.2197	0.193502
KT14	-0.4653	36.0353	0.230035
KT15	-0.8900	36.0960	0.312213
KT16	-0.7442	36.2622	0.183025
KT17	-0.5233	36.6642	0.130690
KT18	-1.0445	36.6863	0.187175
KT20	-1.2690	36.1047	0.174737
KT21	-1.1600	35.9170	0.186150
KT22	-1.5068	35.8225	0.093218
KT24	-1.1290	35.7820	0.139010
KT25	-1.0880	36.4240	-0.047078
KT31	-1.2352	35.0230	-0.104020
KT32	-1.1867	35.2500	-0.163153
KT33	-1.1520	35.5833	-0.096268
KT40	-0.9675	37.4727	0.112977
KT41	-0.9640	37.7095	0.156770
KT42	-0.8318	38.0855	-0.065563
KT43	-0.8300	38.3390	-0.091325
KT45	-0.7330	38.8095	-0.102587
KT46	-0.6275	39.2788	0.031995
KT47	-0.4208	39.6313	0.369858
KTWE	-12.8100	28.2100	-0.148970
KUMI	1.4769	33.8648	-0.106350
KURU	-11.1996	35.4577	-0.156392
KYLA	-9.5986	33.8673	-0.042623
L07	0.4982	35.9080	-0.080643
L16	0.6978	36.0892	0.115693
L17	0.7167	36.1460	0.008300
L19	0.7897	36.2777	0.193060
LAEL	-8.5700	32.0600	-0.022368
LANG	2.7402	33.5637	0.001378
LBB	-11.6310	27.4850	-0.168335
LIGA	-10.6835	35.2545	-0.138643

LIRA	2.1096	33.0643	-0.079598
LIVA	-10.6138	34.1070	-0.093405
LONG	-2.7252	36.6983	0.006128
LOSI	-8.3872	33.1682	-0.103407
LOSS	-8.4200	33.1600	-0.073243
LSZ	-15.2800	28.1900	-0.186092
LWNG	-10.2500	29.9200	-0.068510
MAFI	-8.3100	35.3100	-0.073273
MAKA	-8.8500	34.8300	-0.105682
MAKE	-9.2613	34.0969	-0.099368
MALE	1.0700	34.1670	0.001895
MAND	-10.4782	34.6005	-0.122780
MANG	-7.2000	38.7700	-0.067705
MANS	-11.1400	28.8700	-0.089988
MATA	-8.9614	33.9697	-0.100280
MAUS	-2.7400	36.7000	-0.002135
MBAM	-11.2484	34.7919	-0.133472
MBAR	-0.6019	30.7382	-0.162857
MBEY	-8.9830	33.2410	-0.011455
MBHS	-9.4309	33.9812	-0.104890
MBWE	-4.9600	34.3500	-0.039283
MFRI	-9.2944	35.3129	-0.139132
MGOR	-6.8300	37.6700	-0.046938
MIKU	-7.4000	36.9900	-0.075015
MITU	-6.0200	34.0600	-0.037818
MKIL	-10.8807	34.6813	-0.154245
MKRE	-4.2800	30.4200	-0.045408
MKUS	-13.6000	29.3800	-0.166532
MLBA	-1.8400	31.6700	-0.027295
MLOW	-10.7827	34.2072	-0.143120
MOHO	-8.1400	39.1800	-0.082055
MONG	-15.1500	23.0900	-0.171240
MPIK	-11.8200	31.4500	-0.147370
MTAN	-7.9100	33.3200	-0.121612
MTOR	-5.2500	35.4000	-0.011473
MTVE	-10.2500	40.1670	-0.171247
MTWA	-10.2800	40.1900	-0.091580
MUDI	-9.8621	34.9373	-0.139990
MUFZ	-13.1442	25.0213	-0.187965
MWEN	-10.0600	28.7000	-0.088625
MZM	-11.4300	34.0300	-0.089840
MZUN	-9.1523	33.5217	-0.010593

NAMA	-7.5100	31.0400	-0.010943
NAPK	2.3692	34.3775	-0.088773
NARO	-1.0733	35.8654	0.092273
NBI	-1.2739	36.8037	0.081670
NDEI	-2.6928	38.1687	-0.139352
NGEA	-10.6754	35.6744	-0.156608
NGON	-10.9387	33.9428	-0.132640
NIND	-10.1421	34.5792	-0.170465
NJOM	-9.3700	34.7900	-0.153477
NKAL	-9.1881	33.7736	-0.108345
NTHA	-10.3521	33.6372	-0.076898
PAND	-8.9800	33.2400	0.016765
PIGI	0.2310	32.3190	-0.028873
PNDA	-6.3500	31.0600	-0.036923
PUGE	-4.7100	33.1800	-0.104360
PWET	-8.2800	28.5300	-0.274360
ROTI	1.6260	33.6000	-0.017805
RUNG	-6.9400	33.5200	-0.100087
SAKA	-0.3150	31.7370	-0.048163
SCH	-10.1754	34.0324	-0.104180
SERJ	-13.2300	30.2100	-0.148120
SHWG	-11.1900	31.7400	-0.081460
SING	-4.6400	34.7300	0.024595
SONG	-10.6700	35.6500	-0.170708
SULU	-4.5730	30.0870	-0.060448
SUMB	-7.9500	31.6200	0.028528
TALE	0.9792	34.9760	-0.014905
TARA	-3.8900	36.0200	-0.038600
TEBE	0.0536	32.4830	-0.126518
TEZI	-15.7470	26.0160	-0.229640
THAN	-11.4683	34.1842	-0.130472
THAZ	-10.8305	33.5924	-0.088290
TIRI	-10.7626	34.8831	-0.154888
TOLA	-9.5921	34.5841	-0.116785
TUND	-9.3000	32.7700	0.018765
UKWA	-9.4539	34.2158	-0.112403
UNDA	-9.8536	34.4738	-0.175742
URAM	-5.0900	32.0800	-0.068898
UVZA	-5.1000	30.3900	-0.073483
UWEM	-9.4696	34.7859	-0.141720
VWZM	-11.1753	33.5744	-0.279015
W40	0.2463	35.3493	0.016643

W41	0.0550	35.4743	0.205450
W42	-0.1080	35.7113	0.181705
W43	-0.4180	35.7310	0.140715
W44	-0.5653	35.8355	0.137178
W45	0.2950	35.8033	0.083508
W46	-0.5757	36.0320	0.182435
W47	0.2390	36.0725	0.022753
W48	-0.0542	36.1215	0.056923
W49	-0.4600	36.2200	0.098198
W50	-0.3277	36.3195	0.149615
W51	-0.1065	36.4577	0.076508
W52	0.0623	36.6730	-0.041023
W53	0.1167	37.0217	-0.078505
WALE	-9.7900	37.9200	-0.200880
WENY	-10.1579	33.5574	-0.071598
WINO	-9.7576	35.3001	-0.149287
ZINI	-10.4659	35.3383	-0.167200
ZOMB	-15.3833	35.3500	-0.098775
103B	34.1118	-9.7159	0.006430
104	34.1565	-9.7986	0.300615
105	34.2049	-9.8808	0.287450
106	34.2504	-9.9636	0.279662
107	34.2981	-10.0484	0.341630
109	34.3922	-10.2180	0.431437
110B	34.3960	-10.3224	0.081585
111	34.4103	-10.4263	0.408520
112	34.4035	-10.5291	0.382563
114	34.4101	-10.7366	0.367297
115	34.4136	-10.8407	0.370280
116	34.4190	-10.9653	0.364210
118B	34.4297	-11.2140	0.065628
119	34.4437	-11.3357	0.319305
120	34.4369	-11.4558	0.264487
121	34.4413	-11.5987	0.220417
122	34.4483	-11.6475	0.205030
202	34.1113	-10.0651	0.161793
203B	34.1577	-10.0314	0.009118
204	34.2036	-9.9974	0.297003
206B	34.3199	-9.9119	0.051428
301	34.2593	-10.8588	0.323703
302B	34.3080	-10.8528	0.056833
303	34.3593	-10.8474	0.406045

305	34.5229	-10.8291	0.347165
306	34.5794	-10.8247	0.313848
AMBA	33.2588	-8.1060	-0.075783
AMDT	34.9358	1.9487	-0.038403
ANGA	36.8000	-2.5000	0.066623
BAKO	34.8016	-8.8437	-0.114300
BANG	35.6506	-10.1128	-0.092370
BARI	35.9806	0.4662	0.102422
BASO	35.1382	-4.3238	-0.020133
BEND	31.3920	0.5810	-0.022385
BIHA	31.3160	-2.6380	-0.047595
BKBA	31.8120	-1.3640	-0.028860
BLWY	28.6113	-20.1430	-0.322443
BOBN	29.2367	-1.6600	-0.020275
BOKO	37.7299	-2.2557	0.031708
BOLE	33.7426	-10.9796	-0.123040
BUMI	34.9365	-10.1277	-0.190263
BUTI	31.3260	1.8190	0.127867
CHAL	38.3700	-6.6400	-0.054410
CHAM	31.0700	-10.9500	-0.111320
CHEL	33.8097	-10.5869	-0.072543
CHIM	34.0300	-8.8300	-0.089690
CHML	34.0284	-8.8263	-0.104597
CHUN	33.4337	-8.5434	-0.073415
CPMW	33.2692	-9.7057	-0.020263
CRTR	33.7512	-9.3318	0.023445
DESE	39.6350	11.1180	0.283158
DODT	35.7480	-6.1860	-0.075978
ENUK	33.8859	-11.1799	-0.115047
FOPO	30.2820	0.6630	-0.018895
GAWA	34.3864	-8.7648	-0.121442
GEIT	32.2170	-2.8810	-0.077920
GOMA	29.6927	-4.8392	-0.113687
GULU	32.2848	2.8778	-0.123575
HALE	38.6170	-5.3018	-0.018963
HAMA	32.6420	-3.8320	-0.030968
IFAK	36.6800	-8.1400	-0.094710
IGOM	33.6581	-9.0019	0.046535
ILIN	33.3327	-9.0819	0.013870
ILOM	33.3421	-9.2829	0.014185
INDI	39.7100	-10.0200	-0.189025
INZA	30.3988	-5.1168	-0.122118

IRIN	35.6900	-7.7600	-0.072258
ISOK	33.4944	-9.5090	-0.045895
ITUM	33.1880	-9.4005	-0.036088
JILO	33.5664	-8.7261	-0.023495
JNJA	33.1820	0.4460	-0.032333
JSOK	32.6457	-10.1708	-0.033645
KABG	34.1433	3.5104	-0.034415
KAKA	34.7963	0.5587	-0.027935
KALO	33.6448	-9.9111	-0.053393
KAMZ	24.8044	-14.7948	-0.172873
KAPK	33.4574	-9.7801	-0.043008
KAPO	33.8208	-9.7851	-0.080418
KARM	33.8954	-9.9541	-0.086145
KASM	31.1400	-10.2200	-0.105695
KATE	29.8710	-0.1380	0.053495
KBLE	29.9920	-1.2540	0.069363
KGMA	29.6330	-4.8780	-0.042713
KIBA	36.5695	-5.3223	-0.038505
KIBE	37.4763	-5.3775	-0.020513
KIBO	30.7130	-3.5830	-0.020350
KIDE	35.0214	-9.2745	-0.153048
KIFA	35.1026	-9.5472	-0.144162
KIMA	39.5100	-8.9200	-0.063698
KIMO	36.0463	-10.6922	-0.191557
KIPE	34.4382	-9.2891	-0.116212
KISH	29.6100	-12.0200	-0.168712
KISZ	25.4952	-12.1116	-0.081080
KITG	32.8798	3.2920	-0.097460
KITU	38.0021	-1.3730	0.088858
KMBO	37.2500	-1.1270	0.064840
KMPZ	25.8337	-13.4568	-0.169708
KOMO	36.7192	-3.8422	-0.027633
KOND	35.7965	-4.9040	-0.009445
KOTD	34.1104	3.0002	-0.091848
KR03	35.1650	-0.2928	-0.392867
KR05	35.4960	0.5833	0.185652
KR07	35.7458	-0.2413	0.036348
KR08	35.7095	0.5675	0.261030
KR09	35.9230	-0.3687	-0.426598
KR12	35.9387	-0.1012	0.230225
KR16	36.2905	0.4020	0.036978
KR17	36.3683	-0.8508	-0.060320

KR22	36.5833	0.2238	0.150867
KR24	36.6305	-0.1680	0.048010
KR27	36.8883	-0.1335	0.185218
KR29	37.0300	-0.0348	0.327147
KR30	37.1637	-1.0245	-0.121710
KR31	37.2455	-0.0678	-0.154150
KR32	37.5497	0.3568	-0.014780
KR35	37.8835	0.2867	0.047028
KR42	35.7263	0.0380	0.207220
KT01	36.6545	-1.4387	0.153073
KT02	36.4748	-1.4913	0.112195
KT03	36.1352	-1.3477	0.158110
KT04	35.8430	-1.4467	0.047810
KT05	36.5875	-1.0485	0.196272
KT06	36.2956	-1.0528	0.197030
KT07	35.9158	-1.1507	0.123525
KT08	36.6783	-0.8072	0.171935
KT09	36.2823	-0.7862	0.151190
KT10	35.9733	-0.7422	0.256043
KT11	35.9008	-0.8177	0.233387
KT13	36.2197	-0.4608	0.193502
KT14	36.0353	-0.4653	0.230035
KT15	36.0960	-0.8900	0.312213
KT16	36.2622	-0.7442	0.183025
KT17	36.6642	-0.5233	0.130690
KT18	36.6863	-1.0445	0.187175
KT20	36.1047	-1.2690	0.174737
KT21	35.9170	-1.1600	0.186150
KT22	35.8225	-1.5068	0.093218
KT24	35.7820	-1.1290	0.139010
KT25	36.4240	-1.0880	-0.047078
KT31	35.0230	-1.2352	-0.104020
KT32	35.2500	-1.1867	-0.163153
KT33	35.5833	-1.1520	-0.096268
KT40	37.4727	-0.9675	0.112977
KT41	37.7095	-0.9640	0.156770
KT42	38.0855	-0.8318	-0.065563
KT43	38.3390	-0.8300	-0.091325
KT45	38.8095	-0.7330	-0.102587
KT46	39.2788	-0.6275	0.031995
KT47	39.6313	-0.4208	0.369858
KTWE	28.2100	-12.8100	-0.148970

KUMI	33.8648	1.4769	-0.106350
KURU	35.4577	-11.1996	-0.156392
KYLA	33.8673	-9.5986	-0.042623
L07	35.9080	0.4982	-0.080643
L16	36.0892	0.6978	0.115693
L17	36.1460	0.7167	0.008300
L19	36.2777	0.7897	0.193060
LAEL	32.0600	-8.5700	-0.022368
LANG	33.5637	2.7402	0.001378
LBB	27.4850	-11.6310	-0.168335
LIGA	35.2545	-10.6835	-0.138643
LIRA	33.0643	2.1096	-0.079598
LIVA	34.1070	-10.6138	-0.093405
LONG	36.6983	-2.7252	0.006128
LOSI	33.1682	-8.3872	-0.103407
LOSS	33.1600	-8.4200	-0.073243
LSZ	28.1900	-15.2800	-0.186092
LWNG	29.9200	-10.2500	-0.068510
MAFI	35.3100	-8.3100	-0.073273
MAKA	34.8300	-8.8500	-0.105682
MAKE	34.0969	-9.2613	-0.099368
MALE	34.1670	1.0700	0.001895
MAND	34.6005	-10.4782	-0.122780
MANG	38.7700	-7.2000	-0.067705
MANS	28.8700	-11.1400	-0.089988
MATA	33.9697	-8.9614	-0.100280
MAUS	36.7000	-2.7400	-0.002135
MBAM	34.7919	-11.2484	-0.133472
MBAR	30.7382	-0.6019	-0.162857
MBEY	33.2410	-8.9830	-0.011455
MBHS	33.9812	-9.4309	-0.104890
MBWE	34.3500	-4.9600	-0.039283
MFRI	35.3129	-9.2944	-0.139132
MGOR	37.6700	-6.8300	-0.046938
MIKU	36.9900	-7.4000	-0.075015
MITU	34.0600	-6.0200	-0.037818
MKIL	34.6813	-10.8807	-0.154245
MKRE	30.4200	-4.2800	-0.045408
MKUS	29.3800	-13.6000	-0.166532
MLBA	31.6700	-1.8400	-0.027295
MLOW	34.2072	-10.7827	-0.143120
MOHO	39.1800	-8.1400	-0.082055

MONG	23.0900	-15.1500	-0.171240
MPIK	31.4500	-11.8200	-0.147370
MTAN	33.3200	-7.9100	-0.121612
MTOR	35.4000	-5.2500	-0.011473
MTVE	40.1670	-10.2500	-0.171247
MTWA	40.1900	-10.2800	-0.091580
MUDI	34.9373	-9.8621	-0.139990
MUFZ	25.0213	-13.1442	-0.187965
MWEN	28.7000	-10.0600	-0.088625
MZM	34.0300	-11.4300	-0.089840
MZUN	33.5217	-9.1523	-0.010593
NAMA	31.0400	-7.5100	-0.010943
NAPK	34.3775	2.3692	-0.088773
NARO	35.8654	-1.0733	0.092273
NBI	36.8037	-1.2739	0.081670
NDEI	38.1687	-2.6928	-0.139352
NGEA	35.6744	-10.6754	-0.156608
NGON	33.9428	-10.9387	-0.132640
NIND	34.5792	-10.1421	-0.170465
NJOM	34.7900	-9.3700	-0.153477
NKAL	33.7736	-9.1881	-0.108345
NTHA	33.6372	-10.3521	-0.076898
PAND	33.2400	-8.9800	0.016765
PIGI	32.3190	0.2310	-0.028873
PNDA	31.0600	-6.3500	-0.036923
PUGE	33.1800	-4.7100	-0.104360
PWET	28.5300	-8.2800	-0.274360
ROTI	33.6000	1.6260	-0.017805
RUNG	33.5200	-6.9400	-0.100087
SAKA	31.7370	-0.3150	-0.048163
SCH	34.0324	-10.1754	-0.104180
SERJ	30.2100	-13.2300	-0.148120
SHWG	31.7400	-11.1900	-0.081460
SING	34.7300	-4.6400	0.024595
SONG	35.6500	-10.6700	-0.170708
SULU	30.0870	-4.5730	-0.060448
SUMB	31.6200	-7.9500	0.028528
TALE	34.9760	0.9792	-0.014905
TARA	36.0200	-3.8900	-0.038600
TEBE	32.4830	0.0536	-0.126518
TEZI	26.0160	-15.7470	-0.229640
THAN	34.1842	-11.4683	-0.130472

THAZ	33.5924	-10.8305	-0.088290
TIRI	34.8831	-10.7626	-0.154888
TOLA	34.5841	-9.5921	-0.116785
TUND	32.7700	-9.3000	0.018765
UKWA	34.2158	-9.4539	-0.112403
UNDA	34.4738	-9.8536	-0.175742
URAM	32.0800	-5.0900	-0.068898
UVZA	30.3900	-5.1000	-0.073483
UWEM	34.7859	-9.4696	-0.141720
VWZM	33.5744	-11.1753	-0.279015
W40	35.3493	0.2463	0.016643
W41	35.4743	0.0550	0.205450
W42	35.7113	-0.1080	0.181705
W43	35.7310	-0.4180	0.140715
W44	35.8355	-0.5653	0.137178
W45	35.8033	0.2950	0.083508
W46	36.0320	-0.5757	0.182435
W47	36.0725	0.2390	0.022753
W48	36.1215	-0.0542	0.056923
W49	36.2200	-0.4600	0.098198
W50	36.3195	-0.3277	0.149615
W51	36.4577	-0.1065	0.076508
W52	36.6730	0.0623	-0.041023
W53	37.0217	0.1167	-0.078505
WALE	37.9200	-9.7900	-0.200880
WENY	33.5574	-10.1579	-0.071598
WINO	35.3001	-9.7576	-0.149287
ZINI	35.3383	-10.4659	-0.167200
ZOMB	35.3500	-15.3833	-0.098775

A-7: S-model Station Terms

Table **A-7**: Station IDs, latitude, longitude and station terms for the S-wave tomography model.

Station ID	Latitude	Longitude	Station Term (s)
103B	-9.7159	34.1118	0.135618
110B	-10.3224	34.3960	2.037230
118B	-11.2140	34.4297	0.388715
203B	-10.0314	34.1577	0.187417
206B	-9.9119	34.3199	0.385012
302B	-10.8528	34.3080	-0.026080
AAUS	9.0349	38.7665	1.639510
AMBA	-8.1060	33.2588	0.012388
AMDT	1.9487	34.9358	0.244485
ANGA	-2.5000	36.8000	0.027898
ANKE	9.5827	39.7418	1.859670
BAKO	-8.8437	34.8016	-0.169100
BANG	-10.1128	35.6506	-0.269533
BASO	-4.3238	35.1382	0.253605
BIHA	-2.6380	31.3160	-0.126125
BOBN	-1.6600	29.2367	-0.010660
BOKO	-2.2557	37.7299	0.814500
BOLE	-10.9796	33.7426	-0.242575
BUMI	-10.1277	34.9365	-0.244950
CHAL	-6.6400	38.3700	-0.065325
CHAM	-10.9500	31.0700	-0.322015
CHEL	-10.5869	33.8097	-0.092160
CHIM	-8.8300	34.0300	0.044520
CHML	-8.8263	34.0284	0.031178
CHUN	-8.5434	33.4337	-0.044550
CPMW	-9.7057	33.2692	0.016278
CRTR	-9.3318	33.7512	0.124317
DESE	11.1180	39.6350	1.025580
DODT	-6.1860	35.7480	-0.061630
ENUK	-11.1799	33.8859	-0.253003
GABZ	-12.1710	26.3670	-0.164612
GAWA	-8.7648	34.3864	-0.095863
GEIT	-2.8810	32.2170	-0.228077
GOMA	-4.8392	29.6927	-0.039353
GULU	2.8778	32.2848	0.076550

HALE	-5.3018	38.6170	0.043448
HAMA	-3.8320	32.6420	-0.064038
IFAK	-8.1400	36.6800	-0.124353
IGOM	-9.0019	33.6581	0.212778
ILIN	-9.0819	33.3327	0.090185
ILOM	-9.2829	33.3421	0.093450
INDI	-10.0200	39.7100	-0.110515
INZA	-5.1168	30.3988	-0.117750
IRIN	-7.7600	35.6900	-0.041325
ISOK	-9.5090	33.4944	0.084548
ITUM	-9.4005	33.1880	0.072578
JILO	-8.7261	33.5664	0.054380
JSOK	-10.1708	32.6457	-0.051950
KABG	3.5104	34.1433	0.354708
KALO	-9.9111	33.6448	-0.036540
KAMZ	-14.7948	24.8044	-0.227150
KAPK	-9.7801	33.4574	0.026485
KAPO	-9.7851	33.8208	0.007338
KARM	-9.9541	33.8954	-0.030888
KASM	-10.2200	31.1400	-0.228040
KGMA	-4.8780	29.6330	-0.151457
KIBA	-5.3223	36.5695	0.220592
KIBE	-5.3775	37.4763	0.148308
KIBO	-3.5830	30.7130	-0.154847
KIDE	-9.2745	35.0214	-0.175920
KIFA	-9.5472	35.1026	-0.208730
KIMA	-8.9200	39.5100	0.128592
KIMO	-10.6922	36.0463	-0.470712
KIPE	-9.2891	34.4382	-0.060600
KISH	-12.0200	29.6100	-0.527635
KISZ	-12.1116	25.4952	0.002428
KITG	3.2920	32.8798	0.199905
KMBO	-1.1270	37.2500	0.463055
KMPZ	-13.4568	25.8337	-0.189403
KOMO	-3.8422	36.7192	0.399560
KOND	-4.9040	35.7965	0.289460
KOTD	3.0002	34.1104	0.051910
KTWE	-12.8100	28.2100	-0.366063
KUMI	1.4769	33.8648	0.076723
KURU	-11.1996	35.4577	-0.435013
KYLA	-9.6000	33.8700	0.120280
LAEL	-8.5700	32.0600	-0.076990

LANG	2.7402	33.5637	0.136500
LBB	-11.6310	27.4850	-0.193395
LIGA	-10.6835	35.2545	-0.380495
LIRA	2.1096	33.0643	0.090980
LIVA	-10.6138	34.1070	-0.131205
LOSI	-8.3872	33.1682	-0.081568
LOSS	-8.4200	33.1600	-0.055295
LSZ	-15.2800	28.1900	-0.653428
LWNG	-10.2500	29.9200	-0.148198
MAFI	-8.3100	35.3100	-0.095305
MAKA	-8.8500	34.8300	-0.080260
MAKE	-9.2613	34.0969	0.060913
MAND	-10.4782	34.6005	-0.386400
MANG	-7.2000	38.7700	0.048768
MANS	-11.1400	28.8700	-0.199783
MATA	-8.9614	33.9697	0.065248
MAUS	-2.7400	36.7000	0.279807
MBAM	-11.2484	34.7919	-0.437935
MBAR	-0.6019	30.7382	-0.025848
MBEY	-8.9830	33.2410	0.086550
MBHS	-9.4309	33.9812	0.073113
MBWE	-4.9600	34.3500	0.178228
MFRI	-9.2944	35.3129	-0.189080
MGOR	-6.8300	37.6700	-0.047935
MIKU	-7.4000	36.9900	-0.083025
MITU	-6.0200	34.0600	0.132917
MKIL	-10.8807	34.6813	-0.340640
MKRE	-4.2800	30.4200	-0.188290
MKUS	-13.6000	29.3800	-0.654537
MLBA	-1.8400	31.6700	-0.064795
MLOW	-10.7827	34.2072	-0.179732
MOHO	-8.1400	39.1800	0.322933
MONG	-15.1500	23.0900	-0.193555
MPIK	-11.8200	31.4500	-0.306910
MTAN	-7.9100	33.3200	-0.068308
MTOR	-5.2500	35.4000	0.251883
MTVE	-10.2500	40.1670	0.421822
MTWA	-10.2800	40.1900	0.224027
MUFZ	-13.1442	25.0213	-0.141380
MWEN	-10.0600	28.7000	-0.081498
MZM	-11.4300	34.0300	-0.174640
MZUN	-9.1523	33.5217	0.123875

NAMA	-7.5100	31.0400	-0.133545
NAPK	2.3692	34.3775	0.098725
NBI	-1.2739	36.8037	0.325170
NGEA	-10.6754	35.6744	-0.422930
NGON	-10.9387	33.9428	-0.215798
NIND	-10.1421	34.5792	-0.150867
NJOM	-9.3700	34.7900	-0.158235
NKAL	-9.1881	33.7736	0.077125
NTHA	-10.3521	33.6372	-0.003115
PAND	-8.9800	33.2400	0.081520
PNDA	-6.3500	31.0600	-0.219630
PUGE	-4.7100	33.1800	0.010493
RUNG	-6.9400	33.5200	-0.021738
SCH	-10.1754	34.0324	-0.623677
SERJ	-13.2300	30.2100	-0.478510
SHWG	-11.1900	31.7400	-0.315097
SING	-4.6400	34.7300	0.265358
SONG	-10.6700	35.6500	-0.315817
SULU	-4.5730	30.0870	-0.160167
SUMB	-7.9500	31.6200	-0.094340
TARA	-3.8900	36.0200	0.387290
TEBE	0.0536	32.4830	0.094880
TETE	-16.1300	33.5700	-0.624127
TEZI	-15.7470	26.0160	-0.404593
THAN	-11.4683	34.1842	-0.302712
TIRI	-10.7626	34.8831	-0.358975
TOLA	-9.5921	34.5841	-0.088900
TUND	-9.3000	32.7700	-0.014598
UKWA	-9.4539	34.2158	-0.003590
UNDA	-9.8536	34.4738	-0.102008
URAM	-5.0900	32.0800	-0.039708
UVZA	-5.1000	30.3900	-0.228433
UWEM	-9.4696	34.7859	-0.099660
VWZM	-11.1753	33.5744	-0.232375
WALE	-9.7900	37.9200	-0.382812
WENY	-10.1579	33.5574	-0.047745
WINO	-9.7576	35.3001	-0.199247
ZINI	-10.4659	35.3383	-0.332120
ZOMB	-15.3833	35.3500	1.028320
103B	34.1118	-9.7159	0.135618
110B	34.3960	-10.3224	2.037230
118B	34.4297	-11.2140	0.388715

203B	34.1577	-10.0314	0.187417
206B	34.3199	-9.9119	0.385012
302B	34.3080	-10.8528	-0.026080
AAUS	38.7665	9.0349	1.639510
AMBA	33.2588	-8.1060	0.012388
AMDT	34.9358	1.9487	0.244485
ANGA	36.8000	-2.5000	0.027898
ANKE	39.7418	9.5827	1.859670
BAKO	34.8016	-8.8437	-0.169100
BANG	35.6506	-10.1128	-0.269533
BASO	35.1382	-4.3238	0.253605
BIHA	31.3160	-2.6380	-0.126125
BOBN	29.2367	-1.6600	-0.010660
BOKO	37.7299	-2.2557	0.814500
BOLE	33.7426	-10.9796	-0.242575
BUMI	34.9365	-10.1277	-0.244950
CHAL	38.3700	-6.6400	-0.065325
CHAM	31.0700	-10.9500	-0.322015
CHEL	33.8097	-10.5869	-0.092160
CHIM	34.0300	-8.8300	0.044520
CHML	34.0284	-8.8263	0.031178
CHUN	33.4337	-8.5434	-0.044550
CPMW	33.2692	-9.7057	0.016278
CRTR	33.7512	-9.3318	0.124317
DESE	39.6350	11.1180	1.025580
DODT	35.7480	-6.1860	-0.061630
ENUK	33.8859	-11.1799	-0.253003
GABZ	26.3670	-12.1710	-0.164612
GAWA	34.3864	-8.7648	-0.095863
GEIT	32.2170	-2.8810	-0.228077
GOMA	29.6927	-4.8392	-0.039353
GULU	32.2848	2.8778	0.076550
HALE	38.6170	-5.3018	0.043448
HAMA	32.6420	-3.8320	-0.064038
IFAK	36.6800	-8.1400	-0.124353
IGOM	33.6581	-9.0019	0.212778
ILIN	33.3327	-9.0819	0.090185
ILOM	33.3421	-9.2829	0.093450
INDI	39.7100	-10.0200	-0.110515
INZA	30.3988	-5.1168	-0.117750
IRIN	35.6900	-7.7600	-0.041325
ISOK	33.4944	-9.5090	0.084548

ITUM	33.1880	-9.4005	0.072578
JILO	33.5664	-8.7261	0.054380
JSOK	32.6457	-10.1708	-0.051950
KABG	34.1433	3.5104	0.354708
KALO	33.6448	-9.9111	-0.036540
KAMZ	24.8044	-14.7948	-0.227150
KAPK	33.4574	-9.7801	0.026485
KAPO	33.8208	-9.7851	0.007338
KARM	33.8954	-9.9541	-0.030888
KASM	31.1400	-10.2200	-0.228040
KGMA	29.6330	-4.8780	-0.151457
KIBA	36.5695	-5.3223	0.220592
KIBE	37.4763	-5.3775	0.148308
KIBO	30.7130	-3.5830	-0.154847
KIDE	35.0214	-9.2745	-0.175920
KIFA	35.1026	-9.5472	-0.208730
KIMA	39.5100	-8.9200	0.128592
KIMO	36.0463	-10.6922	-0.470712
KIPE	34.4382	-9.2891	-0.060600
KISH	29.6100	-12.0200	-0.527635
KISZ	25.4952	-12.1116	0.002428
KITG	32.8798	3.2920	0.199905
KMBO	37.2500	-1.1270	0.463055
KMPZ	25.8337	-13.4568	-0.189403
KOMO	36.7192	-3.8422	0.399560
KOND	35.7965	-4.9040	0.289460
KOTD	34.1104	3.0002	0.051910
KTWE	28.2100	-12.8100	-0.366063
KUMI	33.8648	1.4769	0.076723
KURU	35.4577	-11.1996	-0.435013
KYLA	33.8700	-9.6000	0.120280
LAEL	32.0600	-8.5700	-0.076990
LANG	33.5637	2.7402	0.136500
LBB	27.4850	-11.6310	-0.193395
LIGA	35.2545	-10.6835	-0.380495
LIRA	33.0643	2.1096	0.090980
LIVA	34.1070	-10.6138	-0.131205
LOSI	33.1682	-8.3872	-0.081568
LOSS	33.1600	-8.4200	-0.055295
LSZ	28.1900	-15.2800	-0.653428
LWNG	29.9200	-10.2500	-0.148198
MAFI	35.3100	-8.3100	-0.095305

MAKA	34.8300	-8.8500	-0.080260
MAKE	34.0969	-9.2613	0.060913
MAND	34.6005	-10.4782	-0.386400
MANG	38.7700	-7.2000	0.048768
MANS	28.8700	-11.1400	-0.199783
MATA	33.9697	-8.9614	0.065248
MAUS	36.7000	-2.7400	0.279807
MBAM	34.7919	-11.2484	-0.437935
MBAR	30.7382	-0.6019	-0.025848
MBEY	33.2410	-8.9830	0.086550
MBHS	33.9812	-9.4309	0.073113
MBWE	34.3500	-4.9600	0.178228
MFRI	35.3129	-9.2944	-0.189080
MGOR	37.6700	-6.8300	-0.047935
MIKU	36.9900	-7.4000	-0.083025
MITU	34.0600	-6.0200	0.132917
MKIL	34.6813	-10.8807	-0.340640
MKRE	30.4200	-4.2800	-0.188290
MKUS	29.3800	-13.6000	-0.654537
MLBA	31.6700	-1.8400	-0.064795
MLOW	34.2072	-10.7827	-0.179732
MOHO	39.1800	-8.1400	0.322933
MONG	23.0900	-15.1500	-0.193555
MPIK	31.4500	-11.8200	-0.306910
MTAN	33.3200	-7.9100	-0.068308
MTOR	35.4000	-5.2500	0.251883
MTVE	40.1670	-10.2500	0.421822
MTWA	40.1900	-10.2800	0.224027
MUFZ	25.0213	-13.1442	-0.141380
MWEN	28.7000	-10.0600	-0.081498
MZM	34.0300	-11.4300	-0.174640
MZUN	33.5217	-9.1523	0.123875
NAMA	31.0400	-7.5100	-0.133545
NAPK	34.3775	2.3692	0.098725
NBI	36.8037	-1.2739	0.325170
NGEA	35.6744	-10.6754	-0.422930
NGON	33.9428	-10.9387	-0.215798
NIND	34.5792	-10.1421	-0.150867
NJOM	34.7900	-9.3700	-0.158235
NKAL	33.7736	-9.1881	0.077125
NTHA	33.6372	-10.3521	-0.003115
PAND	33.2400	-8.9800	0.081520

PNDA	31.0600	-6.3500	-0.219630
PUGE	33.1800	-4.7100	0.010493
RUNG	33.5200	-6.9400	-0.021738
SCH	34.0324	-10.1754	-0.623677
SERJ	30.2100	-13.2300	-0.478510
SHWG	31.7400	-11.1900	-0.315097
SING	34.7300	-4.6400	0.265358
SONG	35.6500	-10.6700	-0.315817
SULU	30.0870	-4.5730	-0.160167
SUMB	31.6200	-7.9500	-0.094340
TARA	36.0200	-3.8900	0.387290
TEBE	32.4830	0.0536	0.094880
TETE	33.5700	-16.1300	-0.624127
TEZI	26.0160	-15.7470	-0.404593
THAN	34.1842	-11.4683	-0.302712
TIRI	34.8831	-10.7626	-0.358975
TOLA	34.5841	-9.5921	-0.088900
TUND	32.7700	-9.3000	-0.014598
UKWA	34.2158	-9.4539	-0.003590
UNDA	34.4738	-9.8536	-0.102008
URAM	32.0800	-5.0900	-0.039708
UVZA	30.3900	-5.1000	-0.228433
UWEM	34.7859	-9.4696	-0.099660
VWZM	33.5744	-11.1753	-0.232375
WALE	37.9200	-9.7900	-0.382812
WENY	33.5574	-10.1579	-0.047745
WINO	35.3001	-9.7576	-0.199247
ZINI	35.3383	-10.4659	-0.332120
ZOMB	35.3500	-15.3833	1.028320

Appendix B

Model Results

B-1: P-wave Tomography Model Depth Slices

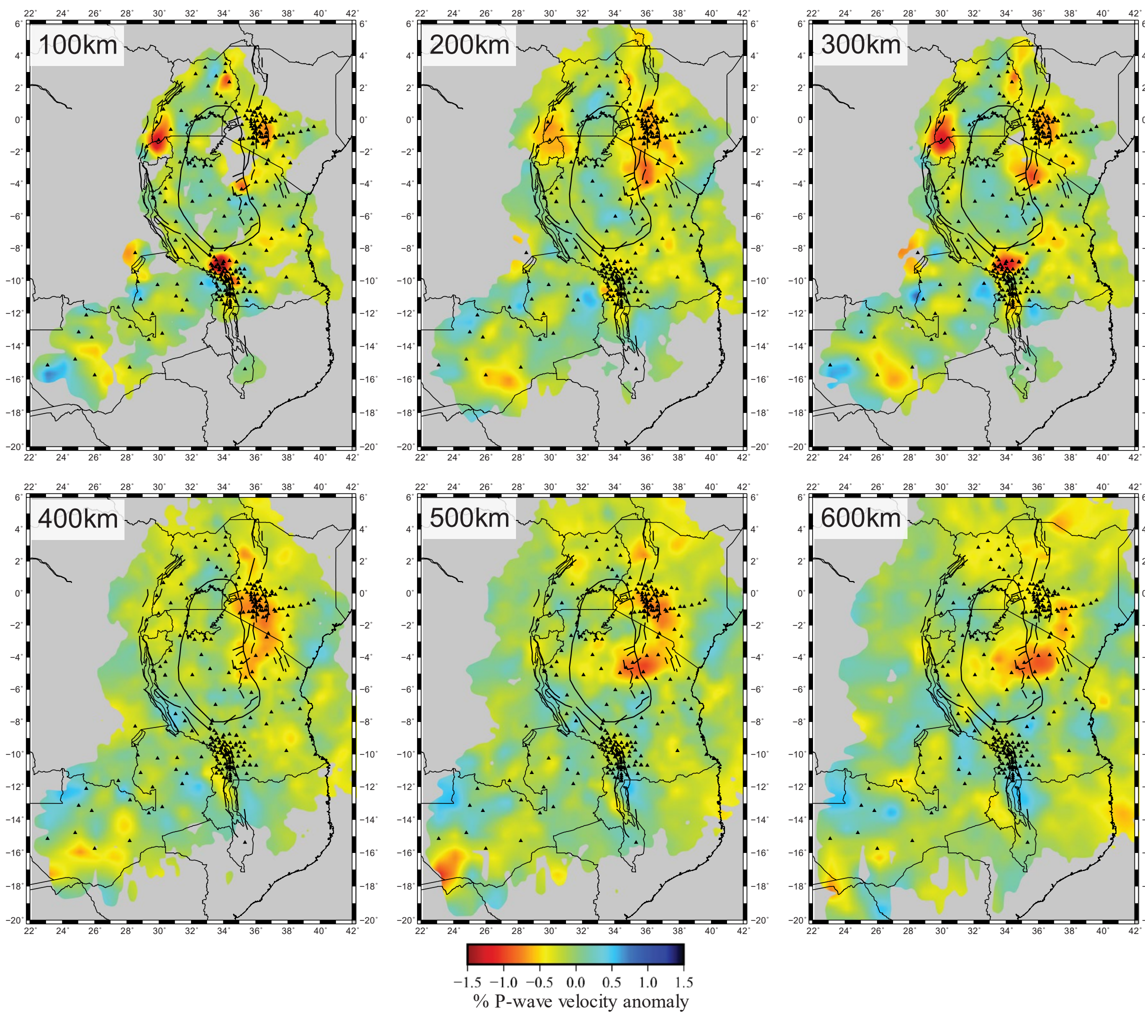

Figure **B-1**: Depth sections for the P-wave tomography model at depths from 100 km to 600 km at 100 km intervals. Geology from [*Mulibo and Nyblade*, 2013].

B-2: P-wave Checkerboard Resolution Tests – 200 km Diameter

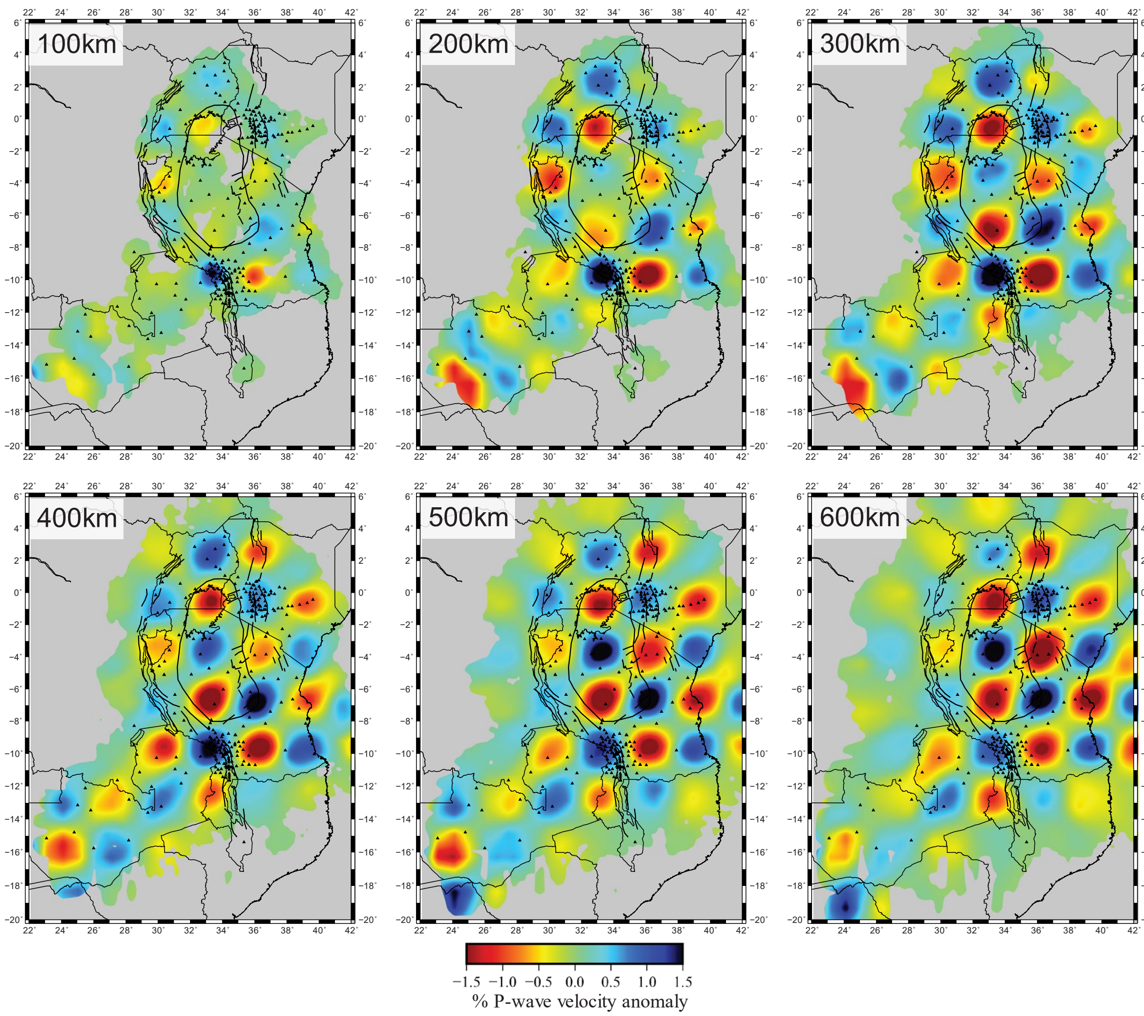

Figure **B-2**: Depth sections of the 200 km wide P-wave checkerboard test results at 100 km intervals from depths of 100 km to 600 km . Geology from [*Mulibo and Nyblade*, 2013].

B-3: P-wave Checkerboard Resolution Tests – 100 km Diameter

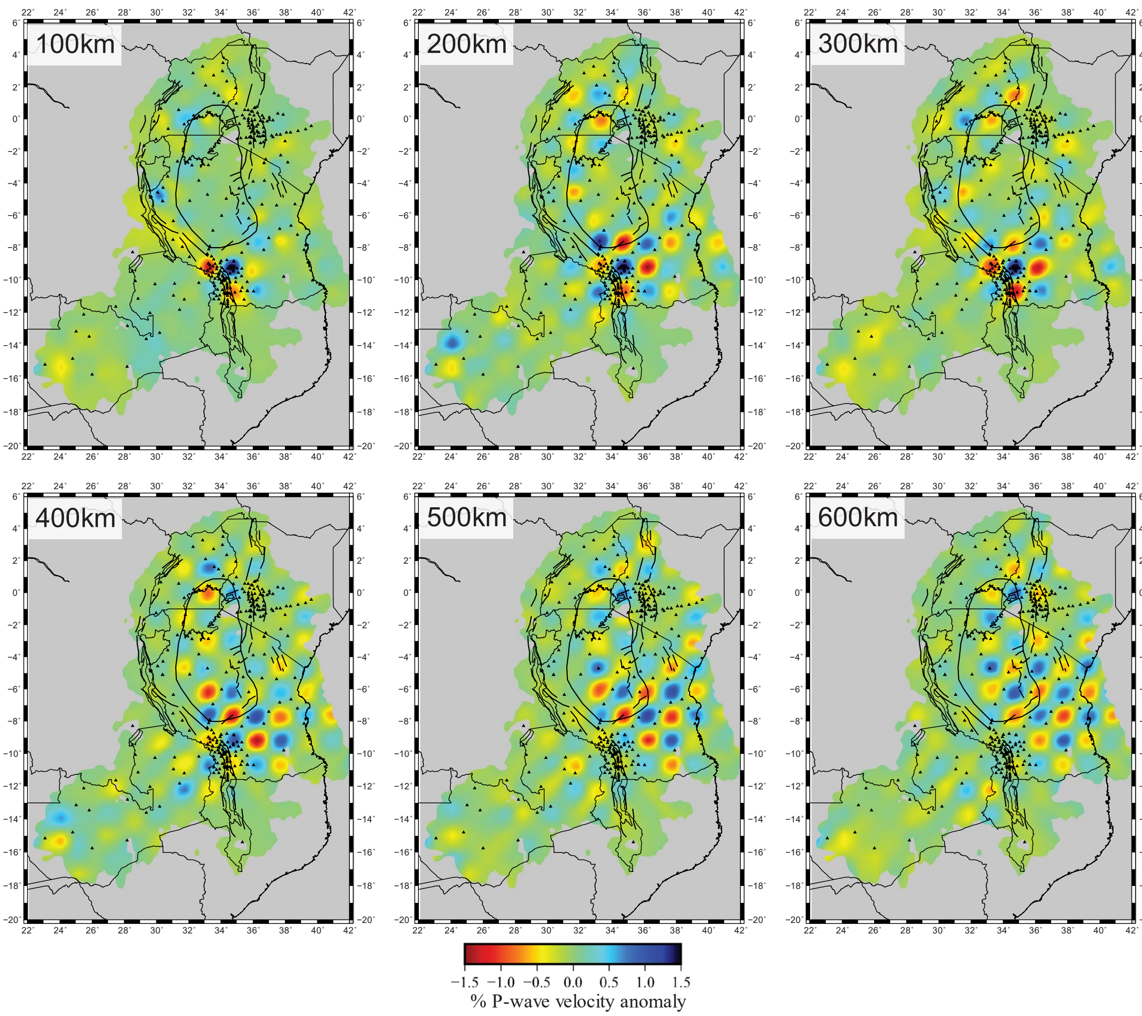

Figure **B-3**: Depth sections of the 100 km wide P-wave checkerboard test results at 100 km intervals from depths of 100 km to 600 km . Geology from [*Mulibo and Nyblade*, 2013].

B-4: S-wave Tomography Model Depth Slices

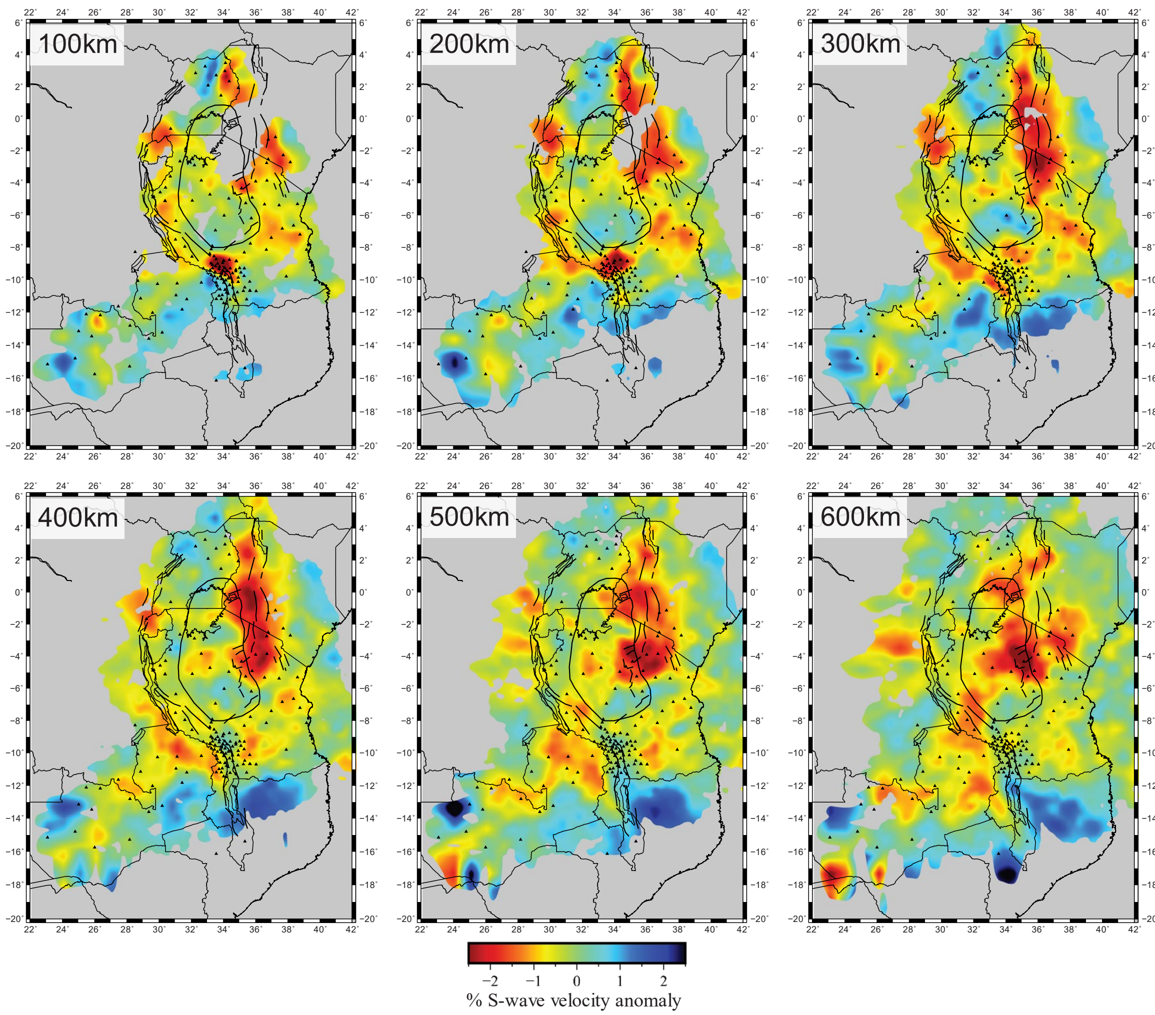

Figure **B-4**: Depth sections for the S-wave tomography model at depths from 100 km to 600 km at 100 km intervals. Geology from [*Mulibo and Nyblade*, 2013].

B-5: S-wave Checkerboard Resolution Tests – 200 km Diameter

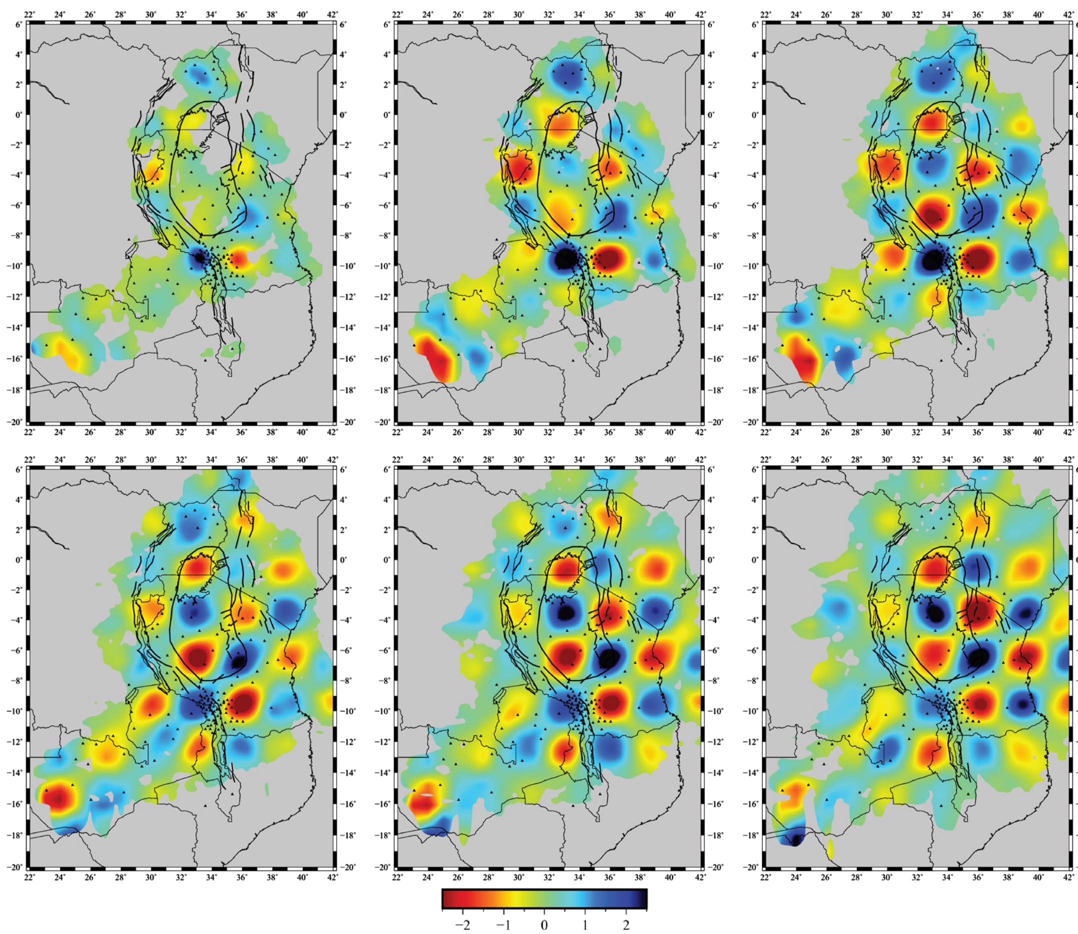

Figure **B-5**: Depth sections of the 200 km wide S-wave checkerboard test results at 100 km intervals from depths of 100 km to 600 km . Geology from [*Mulibo and Nyblade*, 2013].

B-6: S-wave Checkerboard Resolution Tests – 100 km Diameter

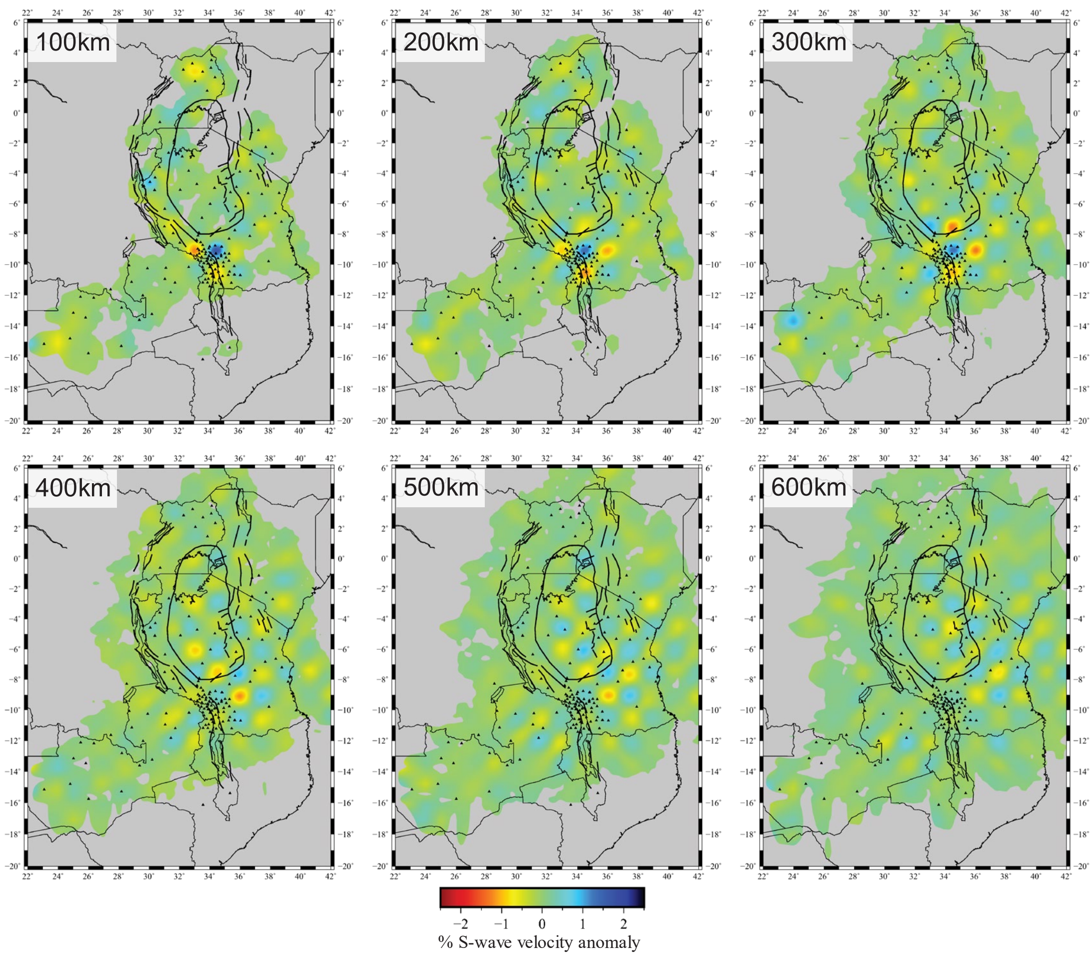

Figure **B-6**: Depth sections of the 100 km wide S-wave checkerboard test results at 100 km intervals from depths of 100 km to 600 km. Geology from [*Mulibo and Nyblade*, 2013].

B-7: P-wave Tabular Body Test – NE Uganda Anomaly

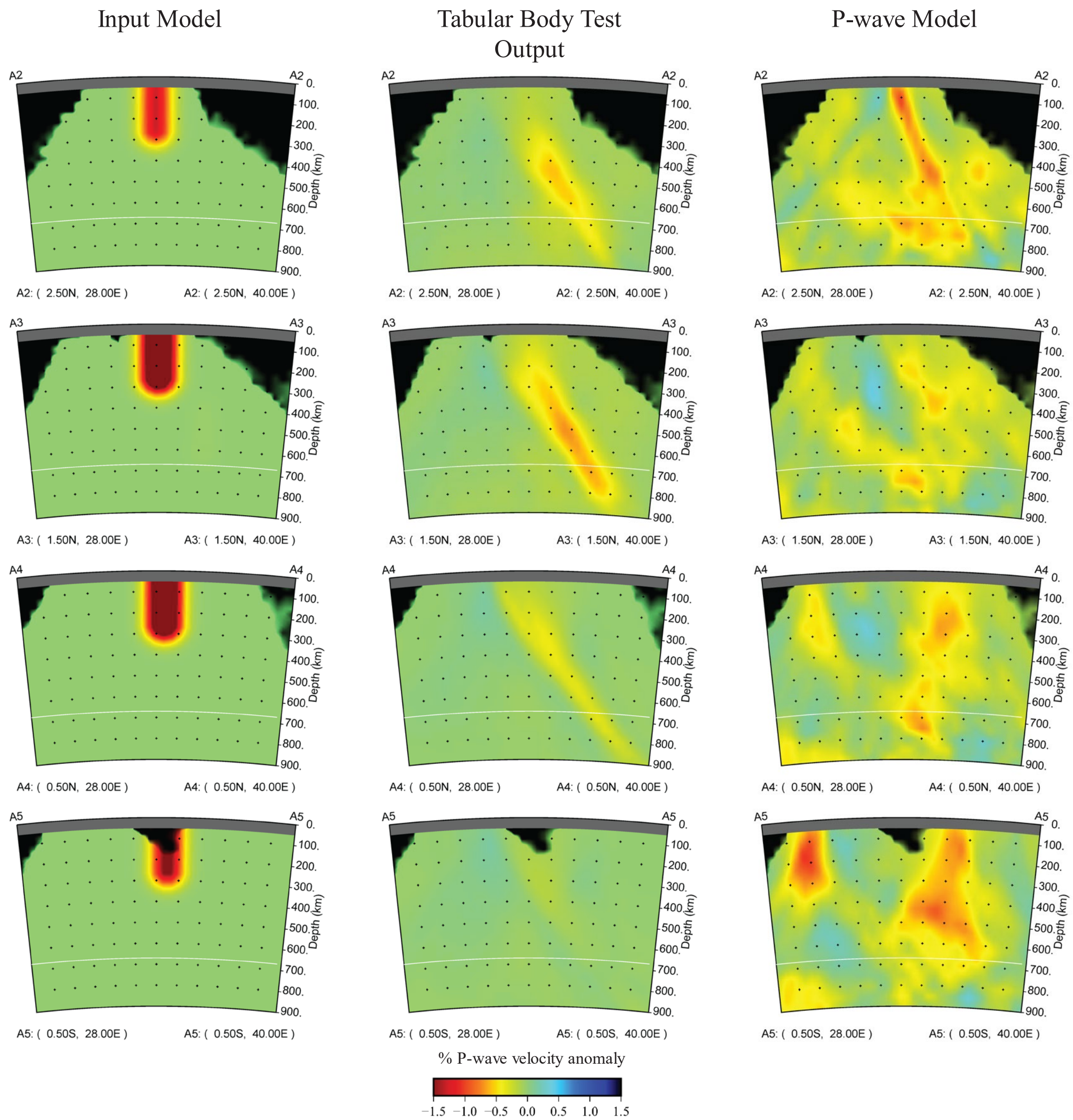

Figure **B-7**: P-wave Tabular body test input (left), Tabular body test results (center) and P-wave model (right) for A3-A3', A4-A4' and A5-A5' vertical cross sections from Figures 4-1, 4-2. And 4-3. The input model includes a 222 km long (N-S), 150 km wide (E-W), and 250 km deep low wave-speed anomaly representing Anomaly B.

B-8: P-wave Tabular Body Test – Kenya Rift Anomaly

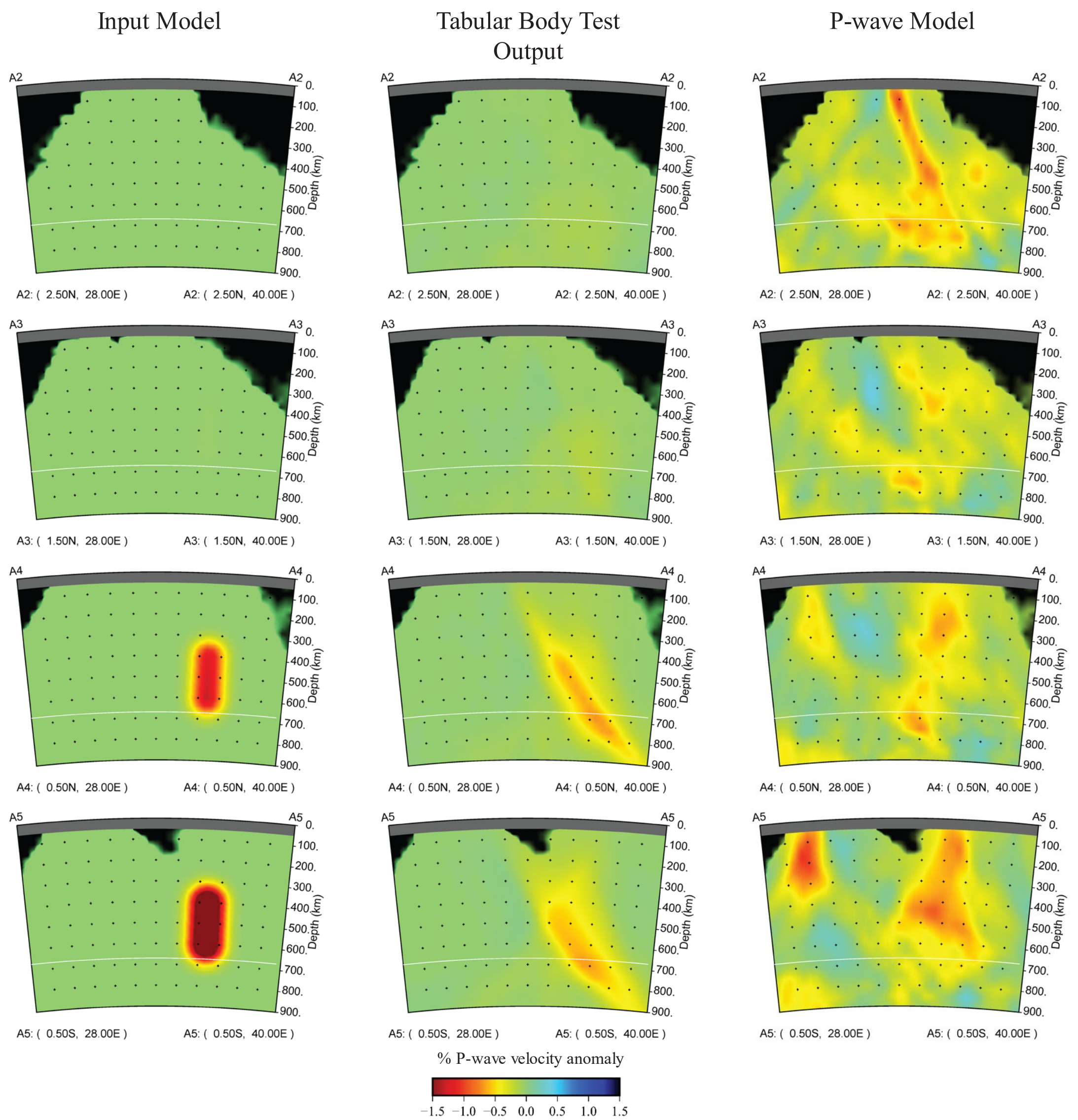

Figure **B-8**: P-wave Tabular body test input (left), Tabular body test results (center) and P-wave model (right) for A3-A3', A4-A4' and A5-A5' vertical cross sections from Figures 4-1, 4-2. And 4-3. The input model includes a 150 km long (N-S), 150 km wide (E-W), and 250 low wave-speed anomaly from depths of 400 to 600 km representing the previously imaged LWA underneath the Kenya Rift.

B-9: S-wave Tabular Body Test – NE Uganda Anomaly

Input Model | Tabular Body Test Output | S-wave Model

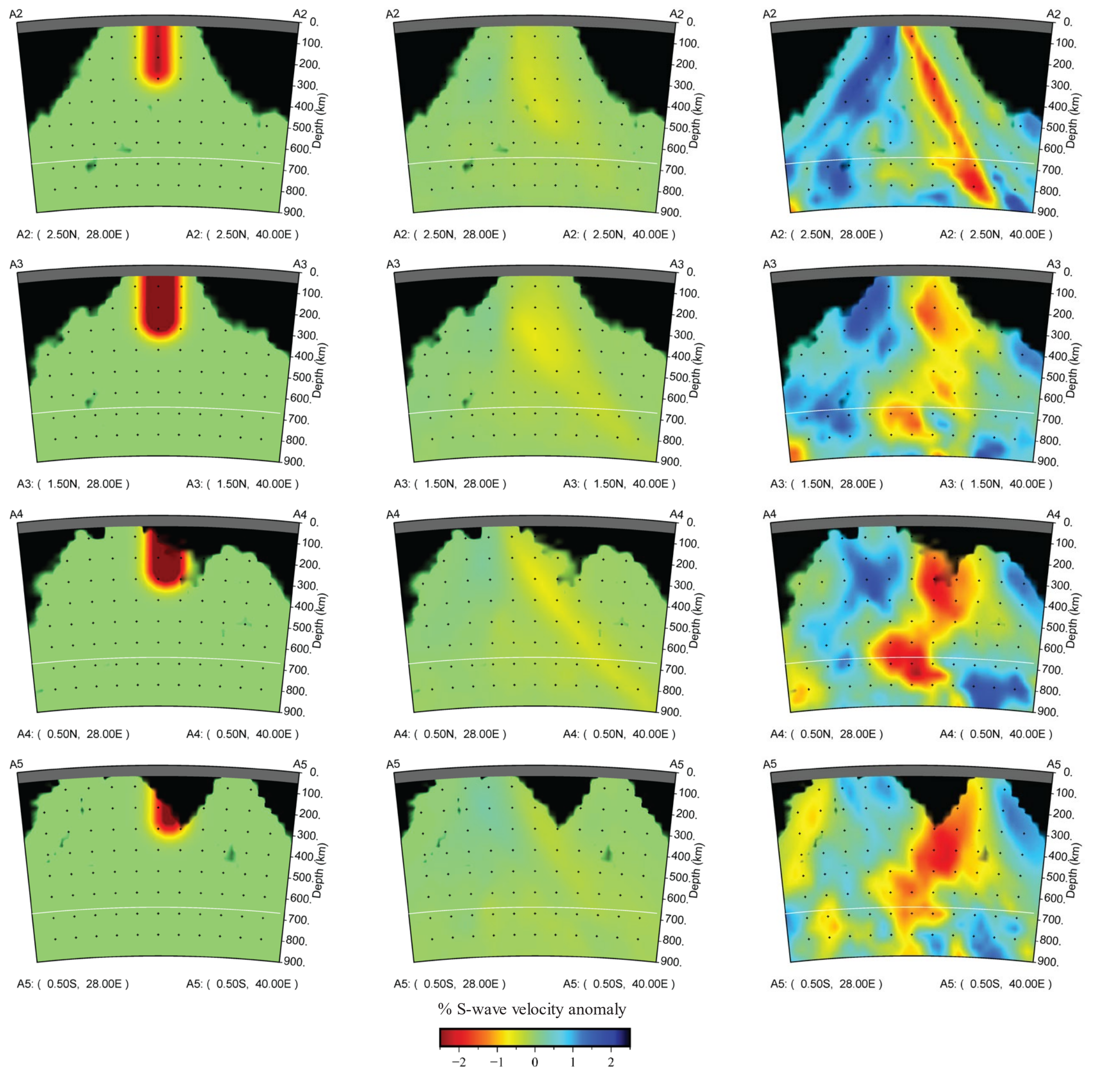

Figure **B-9**: S-wave Tabular body test input (left), Tabular body test results (center) and P-wave model (right) for A3-A3’, A4-A4’ and A5-A5’ vertical cross sections from Figures 4-1, 4-2. And 4-3. The input model includes a 222 km long (N-S), 150 km wide (E-W), and 250 km deep low wave-speed anomaly representing Anomaly B.

B-10: S-wave Tabular Body Test – Kenya Rift Anomaly

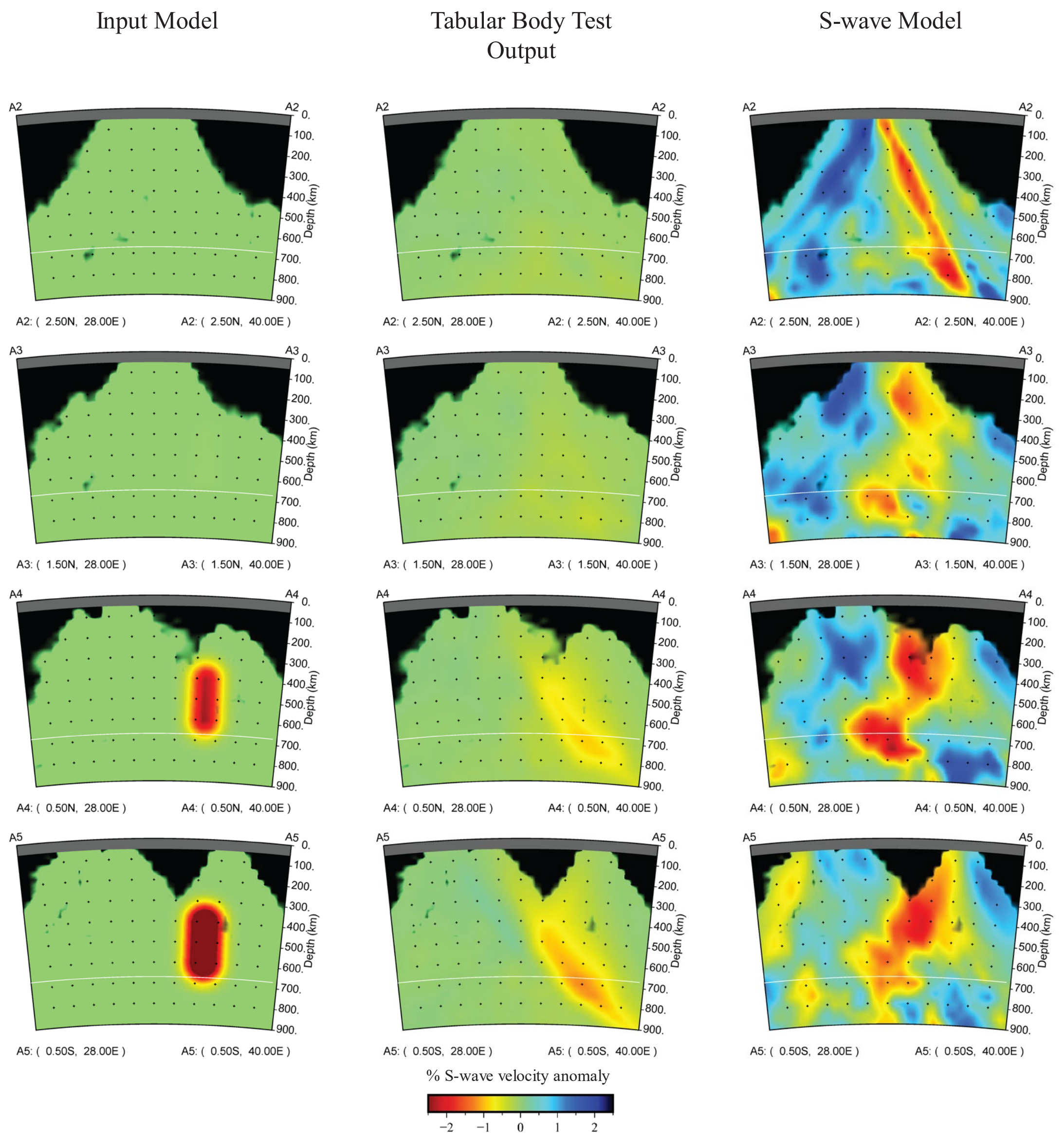

Figure **B-10**: P-wave Tabular body test input (left), Tabular body test results (center) and P-wave model (right) for A3-A3', A4-A4' and A5-A5' vertical cross sections from Figures 4-1, 4-2. And 4-3. The input model includes a 150 km long (N-S), 150 km wide (E-W), and 250 low wave-speed anomaly from depths of 400 to 600 km representing the previously imaged LWA underneath the Kenya Rift.

B-11: P-wave Residuals for Collocated Stations

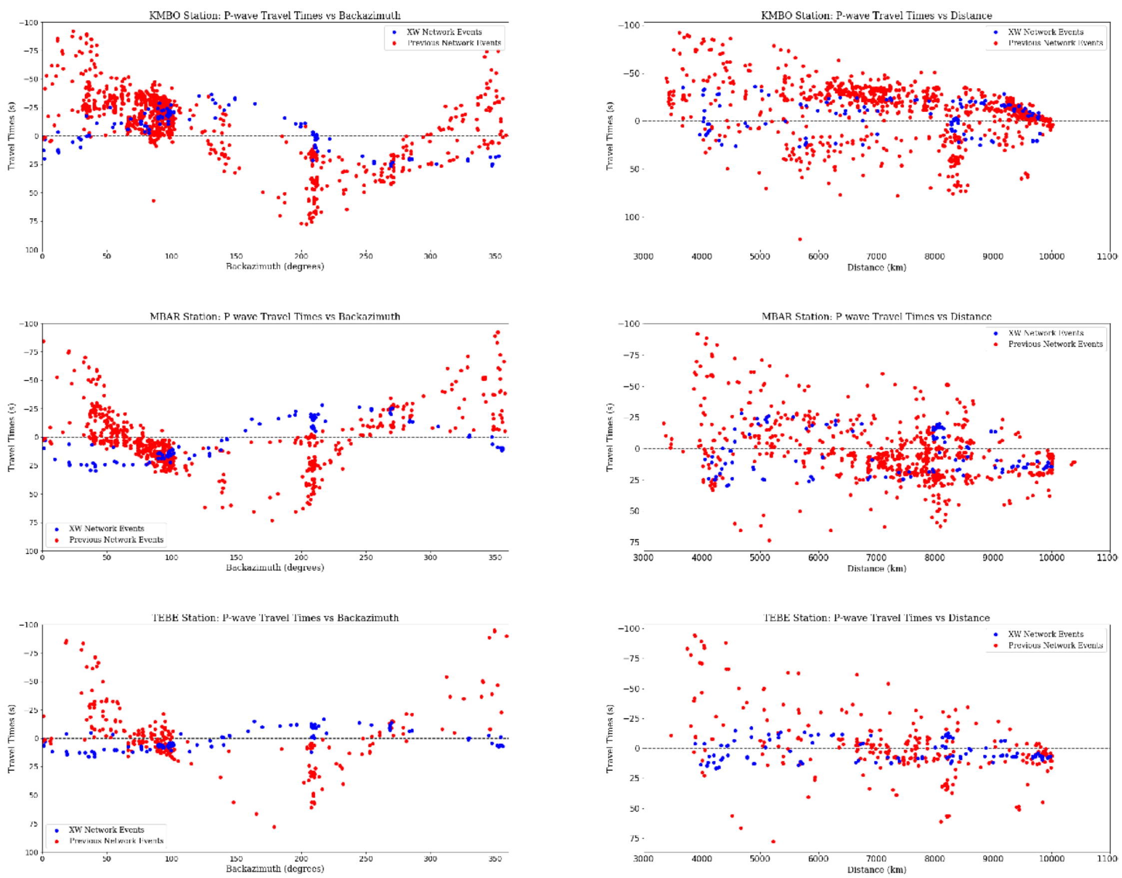

Figure **B-11**: P-wave travel-time residuals for collocated KMBO, TEBE, and MBAR stations vs back azimuth (left) and vs depth (right). The travel time residuals are derived from Section 2.3, Equation 2.3 where the preliminary expected travel time (based on the the IASPI91 velocity model) and the mean of expected travel times for the event are subtracted from the arrival time for the station.

B-12: S-wave Residuals for Collocated Stations

Figure **B-1**2: S-wave travel-time residuals for collocated KMBO, TEBE, and MBAR stations vs back azimuth (left) and vs depth (right). The travel time residuals are derived from Section 2.3, Equation 2.3 where the preliminary expected travel time (based on the the IASPI91 velocity model) and the mean of expected travel times for the event are subtracted from the arrival time for the station.

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